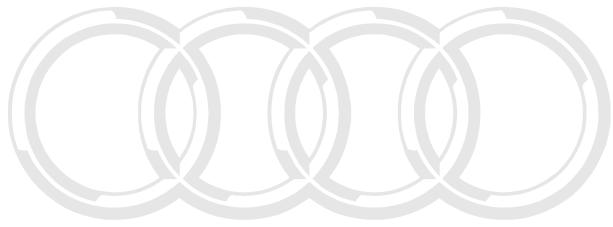


Repair Manual

Audi A1 2011 ➤ ,
Audi A1 Sportback 2018 ➤ ,
Audi A2 2001 ➤ , Audi A3 2004 ➤ ,
Audi A3 2013 ➤ , Audi A3 2021 ➤ ,
Audi A3 China 2021 ➤ ,
Audi A3 Limousine China 2014 ➤ ,
Audi A3 Sportback China 2014 ➤ ,
Audi A4 2001 ➤ , Audi A4 2008 ➤ ,
Audi A4 2015 ➤ ,
Audi A4 Cabriolet 2003 ➤ ,
Audi A5 2016 ➤ ,
Audi A5 Cabriolet 2009 ➤ ,
Audi A5 Coupé 2008 ➤ , Audi A6 1998 ➤ ,
Audi A6 2005 ➤ , Audi A6 2011 ➤ ,
Audi A6 2019 ➤ , Audi A6 China 2012 ➤ ,
Audi A6 China 2019 ➤ ,
Audi A7 Sportback 2011 ➤ ,
Audi A7 Sportback 2018 ➤ ,
Audi A8 2003 ➤ , Audi A8 2010 ➤ ,
Audi A8 2018 ➤ , Audi Q2 2016 ➤ ,
Audi Q3 2012 ➤ , Audi Q3 2019 ➤ ,
Audi Q3 China 2013 ➤ ,
Audi Q3 China 2019 ➤ , Audi Q5 2008 ➤ ,
Audi Q5 2017 ➤ , Audi Q5 China 2010 ➤ ,
Audi Q7 2007 ➤ , Audi Q7 2016 ➤ ,
Audi Q8 2018 ➤ , Audi R8 2007 ➤ ,
Audi R8 2015 ➤ , Audi TT 1999 ➤ ,
Audi TT 2007 ➤ , Audi TT 2015 ➤

Electrical Equipment General Information



Audi

Edition 12.2022

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List of Workshop Manual Repair Groups

Repair Group

- 27 - Battery, Starter, Generator, Cruise Control
- 92 - Wiper/Washer Systems
- 94 - Exterior Lights, Switches
- 96 - Interior Lights, Switches
- 97 - Wiring



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Technical information should always be available to the foremen and mechanics, because their careful and constant adherence to the instructions is essential to ensure vehicle road-worthiness and safety. In addition, the normal basic safety precautions for working on motor vehicles must, as a matter of course, be observed.



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27 – Battery, Starter, Generator, Cruise Control

1 Battery

(Edition 12.2022)

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- ⇒ [“1.1 Battery General Information”, page 1](#)
- ⇒ [“1.2 Battery Types”, page 1](#)
- ⇒ [“1.3 Warnings and Safety Precautions”, page 3](#)
- ⇒ [“1.4 Battery Post/Terminal”, page 5](#)

1.1 Battery General Information

To guarantee a long service life, the Battery - A- must be checked, serviced and maintained as described in this manual.

The Battery - A- supplies the power to start the engine. The Battery - A- also acts as a power reserve for the entire vehicle electrical system.



Note

Refer to ⇒ *Self Study Program No. 234 ; Vehicle Batteries*.



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In order to prevent damage to the Battery - A- or vehicle, note the information about the battery types. Refer to ⇒ “1.2 Battery Types”, page 1 .



WARNING

Risk of injury! Observe all warning messages and safety precautions. Refer to ⇒ “1.3 Warnings and Safety Precautions”, page 3

1.2 Battery Types

- ⇒ [“1.2.1 Battery A with Visual Indicator”, page 2](#)
- ⇒ [“1.2.2 EFB Battery”, page 2](#)
- ⇒ [“1.2.3 AGM Battery”, page 3](#)

General Information



Caution

The Batteries - A- described in the information that follows are maintenance-free Batteries - A- . Do not remove any of the labels on the battery and do not add distilled water. Only perform a visual inspection. Note the chapter on battery testing. Refer to ⇒ “2 Battery, Checking”, page 6 .

1.2.1 Battery - A- with Visual Indicator

Maintenance-free Battery - A- with fluid electrolyte (wet battery).



Caution

Do not remove any of the labels on the battery and do not add any distilled water. Only perform a visual inspection. Note the chapter on battery testing. Refer to [⇒ "2 Battery, Checking", page 6](#).



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

This Battery - A- has a visual indicator. The colors in the visual indicator show the Battery - A- charge and electrolyte level.

Visual indicator color display, checking. Refer to [⇒ "2.3 Visual Indicator Color Display, Checking", page 9](#).

1.2.2 EFB Battery

Maintenance-free Battery - A- with fluid electrolyte (wet battery).



Caution

Do not remove any of the labels on the battery and do not add any distilled water. Only perform a visual inspection. Note the chapter on battery testing.



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

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The Battery - A- is installed in certain Stop/Start vehicles due to special requirements. "EFB" is written on the battery cover to identify this battery.

"EFB" is the English abbreviation for »Enhanced Flooded Battery« (enhanced wet battery).

An EFB battery must only be replaced with another EFB battery.

This Battery - A- has a visual indicator. The colors in the visual indicator show the Battery - A- charge and electrolyte level.

Visual indicator color display, checking. Refer to [⇒ “2.3 Visual Indicator Color Display, Checking”, page 9](#).



Note

“EFB” batteries are being used in certain Audi A1 and Audi A3 models from 08/2011.

1.2.3 AGM Battery

Maintenance-free Battery - A- with fixed electrolyte (AGM battery).

Lead-acid battery, where the electrolyte is fixed in an absorbent glass mat (AGM). The Battery - A- is closed and equipped with valves.

“AGM” is the English abbreviation for »Absorbent Glass Mat«.

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An AGM battery must be replaced with another AGM battery.

1.3 Warnings and Safety Precautions

[⇒ “1.3.1 Hazards when Handling Batteries”, page 3](#)

[⇒ “1.3.2 Battery Safety Label”, page 5](#)

1.3.1 Hazards when Handling Batteries

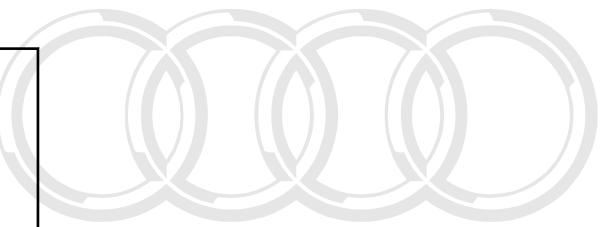
Recognizing and preventing risks

Batteries - A- present risks. Read the warnings on the Battery - A- label, in the ⇒ Owner's Manual , and in ELSA to reduce these risks.



WARNING

- ◆ *Supervised personnel, such as a trainee or an apprentice, may only perform work on vehicle Batteries - A- under supervision of technical personnel, such as a master automotive technician or a master automotive electrician.*
- ◆ *Acid has strong corrosive properties. If Batteries - A- are handled incorrectly, there is a risk that personal injury may result from exposure to damaging electrolyte. Therefore, suitable remedies for acidic chemical burns must be kept readily available. Soapy water is a suitable remedy.*
- ◆ *If electrolyte drips out from the Battery - A-, skin can be burned by acid and the vehicle may be affected by acid erosion and corrosion. It is a possibility that safety-related vehicle components can be damaged.*
- ◆ *When charging and when resting after charging, explosive electrolytic gas is present. In extreme cases when the Battery - A- is handled incorrectly, the emitted gases may cause the battery to explode.*
- ◆ *Replace the Battery - A- if the visual indicator has »no color or is bright yellow«. These cannot be tested or charged and a jump start cannot be given. There is a risk of explosion during testing, charging or jump starting.*
- ◆ *Producing sparks by grinding, welding, cutting and open flames, (also from smoking near the battery) is forbidden. Producing sparks through electrostatic charge must also be avoided. Always touch the vehicle body before touching the Battery - A- .*
- ◆ *Only perform Battery - A- procedures in suitable and well-ventilated areas.*



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WARNING

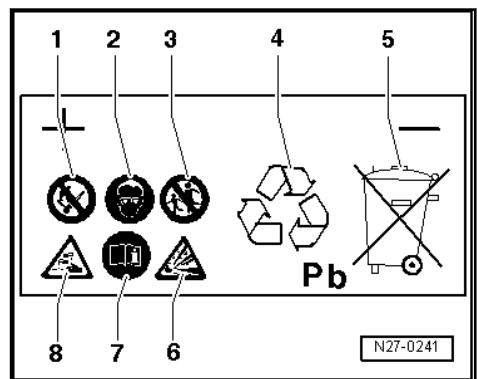
Pollution risk.

- ◆ *Old batteries require special disposal. They contain poisonous lead (Pb) and sulfuric acid.*
- ◆ *Follow disposal requirements, only dispose of used batteries in suitable containers at an authorized collection site.*

1.3.2 Battery Safety Label

Safety label on the Battery - A-

- 1 - Fire, sparks, open flame, and smoking are prohibited when handling and working on the Battery - A- . Avoid generating sparks when working with cables and electrical devices and from electrostatic discharge. Avoid short circuits. For this reason, tools must not be placed on the Battery - A- .
- 2 - Wear protective eyewear when working on the Battery - A- .
- 3 - Always keep acid and Batteries - A- out of the reach of children.
- 4 - Disposal: old batteries are hazardous waste and require special disposal. They may only be disposed of at a suitable collection facility and only according to the legal regulations.
- 5 - Do not dispose of old batteries in household waste.
- 6 - There is a risk of explosion when handling Batteries - A- . Charging the Battery - A- produces a highly explosive gas mixture.
- 7 - Always note the information about the Battery - A- in the ⇒ Electronic Parts Catalog "ETKA" and the ⇒ Owner's Manual .
- 8 - Danger of burns: battery acid is severely corrosive. Therefore, safety gloves and protective eyewear must be worn when working on the Battery - A- . The Battery - A- must not be tipped because acid may spill from the vent openings.



1.4 Battery Post/Terminal



Caution

In order to prevent damage to the battery terminal clamps and battery terminals, observe the following:

- ◆ **Never use force to attach the battery terminal clamps by hand.**
- ◆ **Do not apply grease to battery terminals.**
- ◆ **The battery terminal clamps should be mounted so that the battery terminal sits flush with the clamp or protrudes out of it.**
- ◆ **After tightening the battery terminal clamps to the tightening specification, the threaded connections must not be tightened again.**

Terminal clamp tightening specification. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery .

2 Battery, Checking

- ⇒ “2.1 Test Sequence”, page 6
- ⇒ “2.2 Visual inspection”, page 8
- ⇒ “2.3 Visual Indicator Color Display, Checking”, page 9
- ⇒ “2.4 Battery Test with Vehicle Diagnostic Tester”, page 11
- ⇒ “2.5 Battery Tester VAS 6161”, page 12
- ⇒ “2.6 Battery Tester with Printer VAS 5097 A”, page 17
- ⇒ “2.7 Current Draw Test”, page 23
- ⇒ “2.8 Battery, Checking Resting Voltage, Vehicles in Storage or Inventory”, page 24

2.1 Test Sequence

⇒ “2.1.1 Battery, Checking, Vehicles with Battery Monitoring Control Module J367 or Energy Management Control Module J644 and Data Bus on Board Diagnostic Interface J533”, page 6

⇒ “2.1.2 Battery, Checking, Vehicles without a Battery Monitoring Control Module J367 or Energy Management Control Module J644”, page 7

2.1.1 Battery, Checking, Vehicles with Battery Monitoring Control Module - J367- or Energy Management Control Module - J644- and Data Bus on Board Diagnostic Interface - J533-

- ◆ For certain model lines, the following is responsible for monitoring the electrical system: Energy Management Control Module - J644- or Battery Monitoring Control Module - J367- in connection with the Data Bus on Board Diagnostic Interface - J533-. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations for allocation. The battery test for these vehicles is performed during “Guided Fault Finding”.
- ◆ If the battery test is not possible with “Guided Fault Finding” due to a partially or exhaustively discharged battery, the battery can be quickly evaluated with the help of the “battery test via current draw”.
- ◆ Maintenance-free batteries must not be opened. Otherwise, the warranty is voided.



Caution

It is not possible to check the battery using “Guided Fault Finding” on the following model lines through MY 2010, even if the vehicle has a Battery Monitoring Control Module - J367- :

- ◆ *A3 from MY 2004 (8P)*
- ◆ *TT from MY 2007 (8J)*
- ◆ *R8 from My 2007 (42)*

Battery test. Refer to ⇒ “2.1.2 Battery, Checking, Vehicles without a Battery Monitoring Control Module J367 or Energy Management Control Module J644”, page 7 .



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WARNING

Risk of injury! Observe all warning messages and safety precautions. Refer to [“1.3 Warnings and Safety Precautions”, page 3](#).

Check in the following sequence:

1. Visual inspection. Refer to [“2.2 Visual inspection”, page 8](#).
2. Check the visual indicator color display (if equipped). Refer to [“2.3 Visual Indicator Color Display Checking”, page 9](#). Copyright by AUDI AG.



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

3. Battery Test with Vehicle Diagnostic Tester. Refer to [“2.4 Battery Test with Vehicle Diagnostic Tester”, page 11](#).

2.1.2 Battery, Checking, Vehicles without a Battery Monitoring Control Module - J367- or Energy Management Control Module - J644-



Caution

It is not possible to check the battery using “Guided Fault Finding” on the following model lines through MY 2010, even if the vehicle has a Battery Monitoring Control Module - J367- :

- ◆ *A3 from MY 2004 (8P)*
- ◆ *TT from MY 2007 (8J)*
- ◆ *R8 from My 2007 (42)*



WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to [“1.3 Warnings and Safety Precautions”, page 3](#).

Check in the following sequence:

1. Visual inspection. Refer to [“2.2 Visual inspection”, page 8](#).

2. Check the visual indicator color display (if equipped). Refer to [⇒ "2.3 Visual Indicator Color Display, Checking", page 9](#).



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.



Note

The Battery Tester with Printer - VAS 5097 A- will no longer be used for warranty testing. Only the Battery Tester - VAS 6161- is still being used.

3. Battery test with:

- ◆ Battery Tester - VAS 6161-. Refer to [⇒ "2.5 Battery Tester VAS 6161", page 12](#).
- ◆ Battery Tester with Printer - VAS 5097 A-. Refer to [⇒ "2.6 Battery Tester with Printer VAS 5097 A", page 17](#).

4. Depending on the result of the battery load test, perform a "current draw test". Refer to [⇒ "2.7 Current Draw Test", page 23](#).

2.2 Visual inspection



WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to [⇒ "1.3 Warnings and Safety Precautions", page 3](#).

Before any extensive measurements are taken, visually inspect the exterior of the battery, the connections, and the secure fit of the Battery - A- .



Caution

- ◆ *An improperly secured Battery - A- can lead to damage.*
- ◆ *Excessive vibration due to an improperly secured battery will reduce the battery service life, creates a risk of explosion, can damage the pasted plates, and the battery bracket could damage the battery housing.*
- ◆ *Make sure the Battery - A- is secure. Tighten the bolt to the tightening specification, if necessary.*

Visual Inspection Points:

- ◆ Damage to the battery housing. Acid can leak out if the case is damaged. Battery acid that has leaked out can cause severe damage to the vehicle. Acid that has leaked onto any

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part of the vehicle should be immediately treated with acid neutralizer or soap solution.

- ◆ Damage to the battery terminals. If the battery terminals are damaged, the necessary contact with battery terminals clamps cannot be guaranteed. When connecting the battery terminal clamps, always observe the tightening specification from the corresponding vehicle repair manual. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Battery If the battery terminal clamps are not correctly installed and secured, the wiring may burn. Substantial malfunctions to the electrical system are a consequence. Safe operation of the vehicle can no longer be guaranteed.

2.3 Visual Indicator Color Display, Checking

⇒ "2.3.1 3-Color Visual Indicator, Checking, through 03/2008",
page 9

⇒ "2.3.2 2-Color Visual Indicator, Checking, from 04/2008",
page 10

2.3.1 3-Color Visual Indicator, Checking, through 03/2008



WARNING

*Risk of injury! Pay attention to all warnings and safety precautions. Refer to ⇒ "1.3 Warnings and Safety Precautions",
page 3.*

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Visual indicator general information:

The visual indicator provides information about the electrolyte level and the Battery - A- charge level.

Before the visual inspection, carefully and gently tap the charge indicator with a screwdriver handle. This causes the air bubbles to displace to prevent the display from being impaired. Thereby, the color indicator of the visual indicator is more accurate.



Note

- ◆ Air bubbles can form under the visual indicator, especially if a Battery - A- was recharged or if the Battery - A- was charged while driving. These bubbles may cause the visual indicator to be inaccurate.
- ◆ Since the visual indicator is only located in a single battery cell, the indication is only valid for that cell. An exact assessment of the battery condition can only be determined and confirmed by performing a battery test. Refer to ⇒ "2.6.2 Battery Load Test", page 19.
- ◆ The visual indicator can be located at various locations on the Battery - A- .

There are three possible color displays:

- ◆ »Green«: the Battery - A- is sufficiently charged.
- ◆ »Black«: the Battery - A- is partially charged; the charge level is less than 65% or drained.
- ◆ »No color/bright yellow«: the Battery - A- must be replaced.



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

2.3.2 2-Color Visual Indicator, Checking, from 04/2008



WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to ["1.3 Warnings and Safety Precautions", page 3](#).

Visual indicator general information:

The »green« visual indicator for the charge level indicator is no longer used for these Batteries - A-. Only »black« or »no color/bright yellow« are used.

The color display shows the Battery - A- electrolyte level.

It is no longer possible to read the Battery - A- charge level using the visual indicator. It is necessary to perform a battery test. Refer to ["2.6.2 Battery Load Test", page 19](#).

Before the visual inspection, carefully and gently tap the charge indicator with a screwdriver handle. This causes the air bubbles to disperse to prevent the display from being impaired. Thereby, the color indicator of the visual indicator is more accurate.



Note

- ◆ Air bubbles can form under the visual indicator, especially if a Battery - A- was recharged or if the Battery - A- was charged while driving. These bubbles may cause the visual indicator to be inaccurate.
- ◆ Since the visual indicator is only located in a single battery cell, the indication is only valid for that cell. An exact assessment of the battery condition can only be determined and confirmed by performing a battery test. Refer to ["2.6.2 Battery Load Test", page 19](#).
- ◆ The visual indicator can be located at various locations on the Battery - A-.

Two visual indicators are possible:

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- ◆ »Black«: the electrolyte level is OK
- ◆ »No color/bright yellow«: electrolyte level too low. The Battery - A- must be replaced.



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

2.4 Battery Test with Vehicle Diagnostic Tester

The Battery - A- can also be checked using the ⇒ Vehicle diagnostic tester while it is installed without having a charger connected in vehicles with a Battery Monitoring Control Module - J367- or Energy Management Control Module - J644- and Data Bus on Board Diagnostic Interface - J533- .

Special tools and workshop equipment required

- ◆ ⇒ Vehicle diagnostic tester

Test Requirements

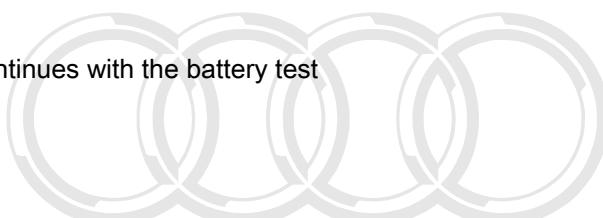
- ◆ No battery charger connected.
- ◆ Battery - A- is connected.
- ◆ Battery temperature at least +10 °C (50 °F).

Procedure

The ⇒ Vehicle diagnostic tester is connected.

- Select the **Diagnostic** mode and start the diagnosis.
- Select the **Test plan** tab.
- Select the **Select individual test** button and select the following tree structure consecutively:
 - ◆ Body
 - ◆ Electrical Equipment
 - ◆ 27 - Starter, Voltage supply
 - ◆ Electrical Components
 - ◆ A - Battery, Checking

The ⇒ Vehicle diagnostic tester continues with the battery test from here on.



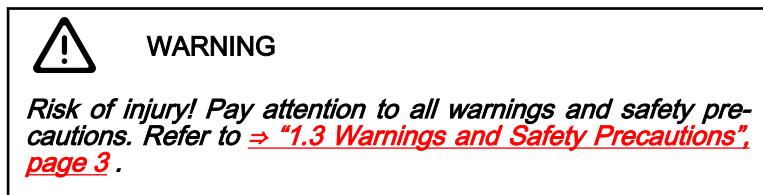
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2.5 Battery Tester - VAS 6161-

- ⇒ “2.5.1 Battery Tester VAS 6161 Device Description”, page 13
- ⇒ “2.5.2 Battery Test, Performing Using the Battery Tester VAS 6161”, page 13
- ⇒ “2.5.3 VW Original Battery Test”, page 14
- ⇒ “2.5.4 Non VW Battery Test”, page 15
- ⇒ “2.5.5 Storage Maintenance, Performing”, page 15
- ⇒ “2.5.6 Explanation of Test Results”, page 16
- ⇒ “2.5.7 Evaluating Test Results”, page 16

General Description:



It is not necessary to disconnect or remove the Battery - A- when using the Battery Tester - VAS 6161- .

The Battery Tester - VAS 6161- does not load the Battery - A- . It works according to the principle of dynamic conductivity.

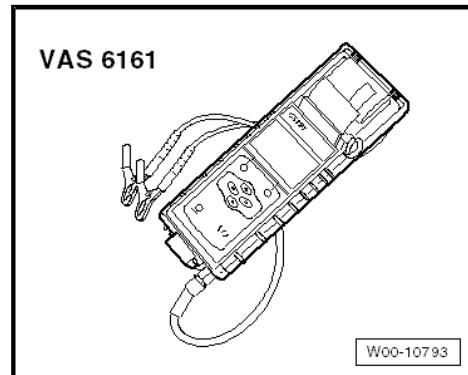
All battery types are stored in the Battery Tester - VAS 6161- .

The data can be stored on an SD card.

The Battery Tester - VAS 6161- can be updated via an interface or an SD card, so that all battery data from Volkswagen is always current.

The integrated infrared sensor (measuring the battery temperature) increases the quality of the measurements.

There is a scanner that can also be used to read the bar code on the Battery - A- .



Refer to the ⇒ *Battery Tester - VAS 6161- Operating Instructions*.

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2.5.1 Battery Tester - VAS 6161- Device Description

Battery Tester - VAS 6161-

- 1 - Internal Printer
- 2 - Operating lever for the paper tray
- 3 - Paper slot
- 4 - Main Menu Display
- 5 - Control Field with [ON/OFF] Button
- 6 - Connection for the battery tester cable
- 7 - SD Memory Card Slot
- 8 - Infrared temperature sensor
- 9 - PC file transmitter



2.5.2 Battery Test, Performing Using the Battery Tester - VAS 6161-

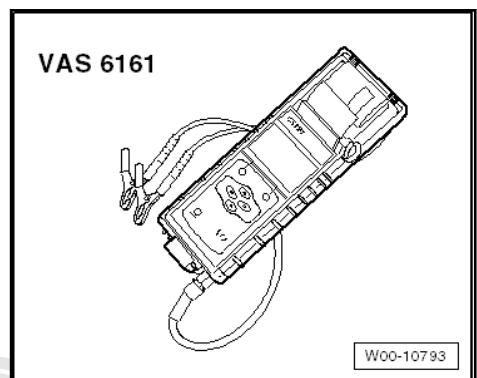


WARNING

*Risk of injury! Follow all Warnings and Safety Precautions.
Refer to ["1.3 Warnings and Safety Precautions", page 3](#).*

Special tools and workshop equipment required

- ◆ Battery Tester - VAS 6161-



Testing the battery:



WARNING

Do not check or charge batteries that have a visual indicator that is light yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

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- Turn off the ignition and all electrical equipment.
- Check the color display for batteries with a visual indicator.
Refer to ["2.1.1 Battery, Checking, Vehicles with Battery Monitoring Control Module J367 or Energy Management"](#)

Control Module J644 and Data Bus on Board Diagnostic Interface J533, page 6 .

- Switch on the unit.
- Clamp the red clamp "+" of the tester to the positive terminal.
- Clamp the black clamp "-" of the tester to the negative terminal.



Make sure the test clamps make good contact!

- Select one of the following tests:



- ◆ VW original battery test: all VW original batteries are checked with this outside of the warranty.
- ◆ Non VW battery test: all batteries from other manufacturers are checked with this.
- ◆ Storage maintenance: for batteries in storage and inventory.
- ◆ VW original battery. Refer to [⇒ "2.5.3 VW Original Battery Test", page 14](#) .
- ◆ Non VW battery. Refer to [⇒ "2.5.4 Non VW Battery Test", page 15](#) .
- ◆ Storage maintenance. Refer to [⇒ "2.5.5 Storage Maintenance, Performing", page 15](#) .



- ◆ The test is over after approximately 10 seconds.
- ◆ The test results are printed out.
- ◆ It is not necessary to let the tester cool down before performing the next measurement.

2.5.3 VW Original Battery Test



WARNING

Do not check or charge batteries that have a visual indicator that is light yellow. Do not give a jump start.

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There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

- Select "VW Original Battery Test" in the menu.
- Select "inside the vehicle" or "outside of the vehicle".
- Select "at the battery terminal" or "at the battery jump start terminal".
- Scan in the battery 2D code or manually select battery type and current strength.

- Measure the temperature. Hold the temperature sensor approximately 5 cm above the battery terminal until the temperature is stable.
- Start the test.
- Print out the test report if necessary.

2.5.4 Non VW Battery Test



Note

- ◆ *The printed test results can differ depending on the software version.*
- ◆ *Refer to the ⇒ Battery Tester - VAS 6161- Operating Instructions .*



WARNING

Do not check or charge batteries that have a visual indicator that is light yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

- Select “Non VW Battery Test” in the menu.
- Select “at the battery terminal” or “at the battery jump start terminal”.
- Select the type of battery: “standard”, “AGM”, “2*6V” or “Gel”.
- Select the standard “CCA”, “JIS”, “DIN”, “SAE”, “IEC” or “EN”.
- Select battery value.
- Measure the temperature. Hold the temperature sensor approximately 5 cm above the battery terminal until the temperature is stable.
- Start the test.
- Print out the test report if necessary.

2.5.5 Storage Maintenance, Performing



WARNING

Do not check or charge batteries that have a visual indicator that is light yellow. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These batteries must be replaced.

- Select “storage maintenance” in the menu.
- Connect the scanner.

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 Note

If there is no scanner, manually enter the VIN on the printed test results.

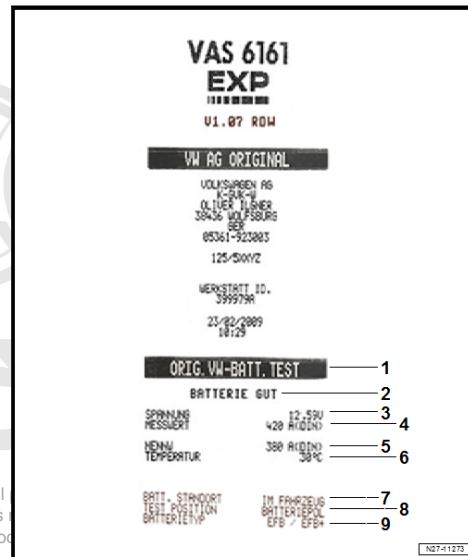
- Scan the VIN.
- Select “at the battery terminal” or “at the battery jump start terminal”.
- Scan in the battery 2D code or manually select the type and manufacturer in the menu.
- Measure the temperature. Hold the temperature sensor approximately 5 cm above the terminal connection until the temperature is stable.
- Start the test.
- Print out the test report if necessary.

2.5.6 Explanation of Test Results

 Note

- ◆ The layout of the printed test results can vary depending on the software version.
- ◆ The printed test results are required for warranty claims.

- 1 - Type of test.
- 2 - Battery test result.
- 3 - Measured voltage.
- 4 - Measured cold start value of the battery.
- 5 - Cold start nominal value set in the tester
- 6 - Measured battery temperature
- 7 - Battery installation location
- 8 - Location of the battery terminal set in the tester
- 9 - Selected battery technology.



2.5.7 Evaluating Test Results

Evaluating the battery test results for the Warranty and Service Tests

Battery test result	Steps
Battery good	No action on the battery
Battery good - recharge	Charge battery. Refer to "3 Battery, Charging", page 26 . If necessary, search for the cause of the discharging
Perform a current draw test	Perform a current draw test. Refer to "2.7 Current Draw Test", page 23 . Charge the battery completely and test again. Refer to "3 Battery, Charging", page 26 .

Battery test result	Steps
Replace the battery	Disconnect the battery and test again. The result "replace the battery" can occur due to a weak cable contact.
Battery cell faulty - replace	Replace the battery
Check the connection	Connect the cable directly to the battery and not to the battery jump start terminal.
Battery depleted	Replace the battery

Evaluating the battery test results for the maintenance test

Battery test result	Steps
Battery good	No measure
Charge the battery immediately	Fully charge the battery. Refer to ⇒ "3 Battery, Charging", page 26 .
Mark as defective	Mark as defective.
Check the tester connection	Disconnect the battery and test again. The result "check the tester connection" can occur because the cable contact is weak.
Check the connection	Connect the cable directly to the battery and not to the battery jump start terminal.
Noises	Wait until the measured value appears in the display.
Battery depleted	Replace the battery

2.6 Battery Tester with Printer - VAS 5097 A-

[⇒ "2.6.1 Battery Tester with Printer VAS 5097 A Device Description", page 18](#)

[⇒ "2.6.2 Battery Load Test", page 19](#)

[⇒ "2.6.3 Cold Crank Amps Table", page 21](#)

[⇒ "2.6.4 Battery Load Test Results", page 22](#)

[⇒ "2.6.5 Printed Test Results Explanations", page 22](#)

[⇒ "2.6.6 Test Result Evaluation", page 22](#)



WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to [⇒ "1.3 Warnings and Safety Precautions", page 3](#).

It is not necessary to disconnect or remove the Battery - A- when using the Battery Tester with Printer VAS 5097 A-.

The following Batteries - A- can be tested using the Battery Tester with Printer - VAS 5097 A- :

- ◆ 80 to 499 A cold crank amps according to German Industry Standardization DIN (Deutsche Industrie Norm). Refer to [①](#).

- ◆ 95 to 574 A cold crank amps according to IEC (International Engineering Consortium)
- ◆ 136 to 855 A cold crank amps according to EN/SAE (European Norm/ Standard of Automotive Engineers)

1) Batteries - A- with cold crank amps greater than 499 A according to the German Industry Standardization (DIN) can be tested with the setting for 499 A according to the German Industry Standardization.

The Batteries - A- are tested by being loaded with a current that corresponds to the starter current of a passenger vehicle. Under this load, the Battery - A- is evaluated and the measurement results are given through the printer.

Note

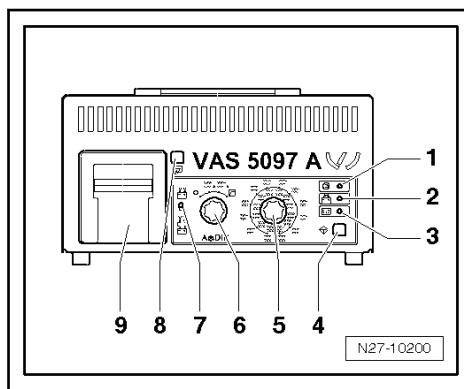
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A- operating instructions and ⇒ Battery Tester with Printer - VAS 5097 A- quick reference guide label on the Battery Tester with Printer - VAS 5097 A- and the cold crank amps table. Refer to ⇒ "2.6.3 Cold Crank Amps Table", page 21 .

- ◆ Battery Tester with Printer - VAS 5097 A- device description. Refer to ⇒ ["2.6.1 Battery Tester with Printer VAS 5097 A Device Description"](#), page 18 .
- ◆ Battery load test. Refer to ⇒ ["2.6.2 Battery Load Test"](#), page 19 .
- ◆ Cold crank amps table. Refer to ⇒ ["2.6.3 Cold Crank Amps Table"](#), page 21 .
- ◆ Battery load test results. Refer to ⇒ ["2.6.4 Battery Load Test Results"](#), page 22 .
- ◆ Printed test results explanations. Refer to ⇒ ["2.6.5 Printed Test Results Explanations"](#), page 22 .
- ◆ Test result evaluation. Refer to ⇒ ["2.6.6 Test Result Evaluation"](#), page 22 .

2.6.1 Battery Tester with Printer - VAS 5097 A- Device Description

Battery Tester with Printer - VAS 5097 A-

- 1 - Green LED, "Device in use"
- 2 - Red LED, "Device connected with terminals reversed"
- 3 - Red LED, "battery cannot be tested", the Battery - A- must be replaced.
- 4 - **Start** button
- 5 - Cold crank amps selector switch
- 6 - **ON/OFF** Button
- 7 - Sliding switch (battery hook-up to the Battery - A- /at jump start connection)
- 8 - **Paper Feed** Button
- 9 - Printer



2.6.2 Battery Load Test

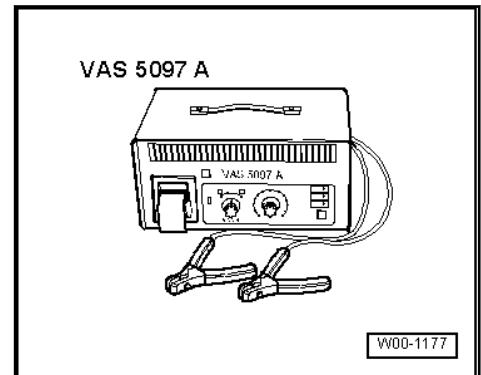


WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to ["1.3 Warnings and Safety Precautions", page 3](#).

Special tools and workshop equipment required

- ◆ Battery Tester with Printer - VAS 5097 A-



Pay attention to the ⇒ TPL 2012182 .

Procedure



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.



Note

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Caution

- ◆ Turn off the ignition and all electrical equipment.
- ◆ Remove the ignition key.

- Check the color display on Batteries - A- with a visual indicator. Refer to ["2.1.1 Battery, Checking, Vehicles with Battery Monitoring Control Module J367 or Energy Management Control Module J644 and Data Bus on Board Diagnostic Interface J533 ", page 6](#) .
- Switch on the Battery Tester with Printer - VAS 5097 A- . Refer to ["2.6.1 Battery Tester with Printer VAS 5097 A Device Description", page 18](#) .
- Determine the cold crank amps according to the specifications on the Battery - A- in amperes (A) according to the

German Industry Standardization (DIN) and determine the Battery Tester With Printer - VAS 5097 A- adjustment range using the table. Refer to [⇒ “2.6.3 Cold Crank Amps Table”, page 21](#).

 Note

If the Battery - A- does not state this value in DIN but rather in IEC or EN/SAE, then convert the value using the table (refer to [⇒ “2.6.3 Cold Crank Amps Table”, page 21](#)) or the table on the Battery Tester with Printer - VAS 5097 A-.

- Set the cold crank amps with the cold crank amps selector switch. Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#).
- Set the measuring range (80 to 379 A or 380 to 499 A) using the [ON/OFF] button. Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#).

 Note

Batteries - A- with cold crank amps greater than 499 A according to the German Industry Standardization (DIN) can be tested with the setting for 499 A according to the German Industry Standardization.

- Connect the red terminal (+) to the positive terminal of the Battery - A- .
- Connect the black terminal (-) to the negative terminal for the Battery - A- .

 Note

- ◆ Make sure the test terminals make sufficient contact.
- ◆ Note ⇒ TPL 2012182 for the Battery Tester with Printer - VAS 5097 A- .

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- Using the sliding switch, select the test clamp connection point. Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#).

1 - Direct Connection to the Battery - A-

2 - Connection to the battery jump start terminal

- Check if the cold crank amps indicated on the Battery - A- matches the selected value on the Battery Tester with Printer - VAS 5097 A- .

- Press the **Start** button. Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#)

The green LED turns on. Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#). The test program runs automatically. The test results are printed out.

Refer to [⇒ “2.6.4 Battery Load Test Results”, page 22](#). If the Battery Tester with Printer - VAS 5097 A- does not start, (the LED does not come on and there is no print out), then charge the Battery - A- . Refer to [⇒ “3 Battery, Charging”, page 26](#).

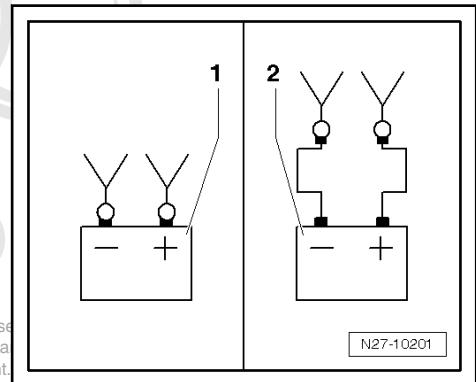
- Switch off the Battery Tester with Printer - VAS 5097 A- . Refer to [⇒ “2.6.1 Battery Tester with Printer VAS 5097 A Device Description”, page 18](#) .
- Remove the test terminals.

Note

- ◆ *The test is over after approximately 20 seconds.*
- ◆ *The test results are printed out.*
- ◆ *Only perform the test once. Repeating the test will not produce accurate results.*
- ◆ *The Battery Tester with Printer - VAS 5097 A- needs approximately 30 minutes to cool off before it is ready for the next measurement.*

2.6.3 Cold Crank Amps Table

Cold crank amps in A		
EN/SAE	IEC	German Industry Standardization (DIN)
136 – 177	95 – 124	80 – 104
178 – 219	125 – 154	105 – 129
220 – 261	155 – 184	130 – 154
262 – 303	185 – 214	155 – 179
304 – 345	215 – 244	180 – 204
346 – 387	245 – 274	204 – 229
388 – 429	275 – 304	230 – 254
430 – 471	305 – 334	255 – 279
472 – 513	335 – 364	280 – 304
514 – 555	365 – 394	305 – 329
556 – 597	395 – 424	330 – 354
598 – 639	425 – 454	355 – 379
640 – 657	455 – 464	380 – 389
658 – 675	465 – 474	390 – 399
676 – 693	475 – 484	400 – 409
694 – 711	485 – 494	410 – 419



N27-10201

Cold crank amps in A		
EN/SAE	IEC	German Industry Standardization (DIN)
712 – 729	495 – 504	420 – 429
730 – 747	505 – 514	430 – 439
748 – 765	515 – 524	440 – 449
766 – 783	525 – 534	450 – 459
784 – 801	535 – 544	460 – 469
802 – 819	545 – 554	470 – 479
820 – 837	555 – 564	480 – 489
838 – 855	565 – 574	490 – 499. Refer to ²⁾ .

2) Batteries - A- with cold crank amps greater than 499 A according to the German Industry Standardization (DIN) can be tested with the setting for 499 A according to the German Industry Standardization.

2.6.4 Battery Load Test Results

By placing the battery under a strong load during the Battery - A- load test, the battery voltage will be reduced.

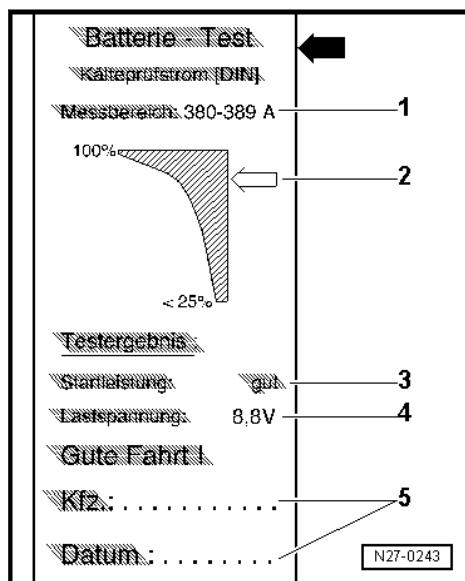
- ◆ If the Battery - A- is OK, the voltage drops only to the specified minimum voltage.
- ◆ If the **Battery - A- is defective or has a low charge, the battery voltage will drop very quickly to below the specified minimum voltage.**
- ◆ After testing, this low voltage level is maintained for a lengthy period and only increases again slowly.
- ◆ Only perform the test once. Repeating the test will not produce accurate results.
- ◆ In order to be able to test another/additional Battery - A- , the Battery Tester with Printer - VAS 5097 A- must cool down for approximately 30 minutes for the test result to be correct.

2.6.5 Printed Test Results Explanations

- 1 - Measuring range is set on the Battery Tester with Printer - VAS 5097 A-
- 2 - Diagram; the -arrow- points to the Battery - A- status.
- 3 - Test result
- 4 - Battery - A- voltage during the battery load test.
- 5 - Vehicle data and date. Filled out by the tester.

Note

- ◆ *The printed test results are required for warranty claims.*
- ◆ *Only perform the test once. Repeating the test will not produce accurate results.*



2.6.6 Test Result Evaluation

Printout	Measures
Starting power very good	Battery - A- is OK.
Starting power good	Battery - A- is OK.

Printout	Measures
Starting power sufficient	Evaluation through the current draw test. Refer to ⇒ "2.7 Current Draw Test", page 23 .
Starting power poor	Evaluation through the current draw test. Refer to ⇒ "2.7 Current Draw Test", page 23 .
Starting power very poor	Evaluation through the current draw test. Refer to ⇒ "2.7 Current Draw Test", page 23 .
Cannot be tested	– Charge the Battery - A- and perform the test again. Refer to ⇒ "3 Battery, Charging", page 26 .

2.7 Current Draw Test



WARNING

Do not check or charge a Battery - A- when the visual indicator has »no color or is bright yellow«. Do not give a jump start.

There is a risk of explosion during testing, charging or jump starting.

These Batteries - A- must be replaced.

Make sure the correct charging mode is set on the battery charger so the current draw test is not inaccurate. Refer to [⇒ Battery Charger Operating Instructions](#).

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In order to receive a quick indication of discharged Batteries

- A-, a conclusion can be made during the charging process based on the Battery - A- current draw as to whether the Battery - A- should be replaced or charged completely.



Note

In the case of the Battery Tester - VAS 6161-, the current draw test must always be conducted when the test result "conduct current draw test" appears in the display.

The current draw test should always be performed if the test using the Battery Tester with Printer - VAS 5097 A- had the following results:

- 1 - Starting power sufficient
- 2 - Starting power poor
- 3 - Starting power very poor
- 4 - Cannot be tested - charge the Battery - A- and perform the test again
- 5 - Battery Tester with Printer - VAS 5097 A- does not turn on (no LED, no printout)

Depending on the test results from the Battery Tester with Printer - VAS 5097 A- (refer to [⇒ "2.6.6 Test Result Evaluation"](#),

[page 22](#)), additional test steps or tasks for a clear evaluation of the battery charge must be performed.

By checking a current draw capacity on a Battery - A- during the charging procedure, it can be determined in a short time if a partially discharged or severely discharged Battery - A- can become operable again by further charging. Refer to [⇒ “3.3 Severely Discharged Batteries”, page 27](#).

Test Requirements

- ◆ When charging a battery, the battery temperature must be at least 10 °C (50 °F).
- ◆ The charger must be able to deliver at least 30 A charge current, such as on the Battery Charger - VAS 5095 A- / Battery Charger - VAS 5900- / Battery Charger - VAS 5903- .
- ◆ When charging with the Battery Charger - VAS 5095 A- , the Battery - A- current draw must be measured using a current probe (Test Instrument Set - Current Clamp - 100A - VAS 6356/4A-).
- ◆ The Battery Charger - VAS 5900- and the Battery Charger - VAS 5903- indicate the current draw.

Procedure

- Connect the Battery - A- to the Battery Charger and start the charging process.
- Measure the Battery - A- charge current after five minutes.

Test result

The charge current must be above 10% of the nominal capacity five minutes after charging begins.

Example:

With a 60 Ah battery, the charge current must be greater than 6 A 5 minutes after charging begins.

- Fully charge the Battery - A- if the charge current is higher than 10% of the nominal capacity.
- Let the Battery - A- sit for two hours and then perform the battery load test. Refer to [⇒ “2.6.2 Battery Load Test”, page 19](#) .

If the charge current is less than 10% of the nominal capacity (less than 6 A for a 60 Ah battery) five minutes after starting the charging, then replace the Battery - A- . Refer to [⇒ Electrical Equipment; Rep. Gr. 27 ; Battery; Battery, Removing and Installing](#) .

- In warranty and goodwill cases, fill out the battery test sheet and keep it with the Battery - A- .

2.8 Battery, Checking Resting Voltage, Vehicles in Storage or Inventory



WARNING

Risk of injury! Pay attention to all warnings and safety precautions. Refer to [⇒ “1.3 Warnings and Safety Precautions”, page 3](#) .

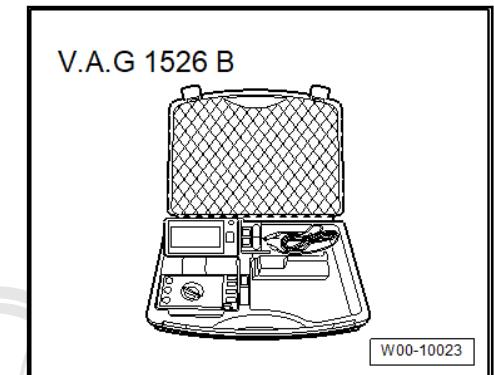


Note

- ◆ *The resting voltage may only be measured on vehicles in storage or inventory within the scope of the prescribed maintenance and care work as an assessment criteria for the Battery - A- condition.*
- ◆ *The resting voltage measurement serves to determine if it is necessary to recharge the Battery - A- on vehicles in storage or inventory. Refer to ⇒ Maintenance Tables "Service for Vehicles in Storage or Inventory".*

Special tools and workshop equipment required

- ◆ Analog/Digital Multimeter - FLU83III-



Test Conditions

The Battery - A- may not be charged or discharged for at least two days.

Procedure

- Measure the Battery - A- resting voltage using the Analog/Digital Multimeter - FLU83III- .

Test result

No load voltage	Charge level	Battery - A- charge
11.60 V	0 %	Discharge, the whole capacity is removed. Charging totally discharged batteries. Refer to ⇒ "3.3 Severely Discharged Batteries", page 27 .

Measured value	Required actions
Resting voltage greater than or equal to 12.5 V	Resting voltage OK
Resting voltage lower than 12.5 V	– Charge the Battery - A-. Refer to ⇒ "3 Battery, Charging", page 26 .

3 Battery, Charging

⇒ “3.1 Battery, Charging”, page 26

⇒ “3.2 Service Charge”, page 27

⇒ “3.3 Severely Discharged Batteries”, page 27

3.1 Battery, Charging



WARNING

Risk of explosion due to discharged battery with visual indicator. Severe injury is possible.

If the color display is colorless or light yellow, do not charge or jump start the battery.

Replace the battery.



WARNING

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There is the risk of an explosion due to severely discharged batteries. Severe injury is possible.

Do not charge or jump start a severely discharged battery.

Replace the battery.

Conditions

- The battery temperature must be at least 10 °C (50 °F).
- Read the ⇒ Battery Charger Operating Instructions .

Procedure

Place the vehicle key and other start authorization systems (such as smartphones) outside of the vehicle interior.

Continuation

- Switch off the ignition.

Tip

Charging the battery takes place in the installed and connected position.

Vehicles with passenger compartment battery

Batteries may be jump started at the jump start connection with a charge current of maximum “50A”.

Continuation for all vehicles

Tip

Charging the battery takes place in the installed and connected position.

- Connect the red charging clamp (+) on the positive terminal of the battery or on the positive terminal grip.
- Connect the black charging clamp (-) on the negative terminal.
- Follow the instructions on the screen.

- Stop the charging process at 100% battery charge and remove the battery charger.

3.2 Service Charge

The battery charger ensures a safe charging procedure and preserves the charge of the battery.

- ◆ For diagnostic/service work
- ◆ For software updates
- ◆ For flash campaigns
- ◆ In showroom operating mode

Maintenance charging can be performed without time restrictions.

Conditions

- For the software update use a battery charger with at least a charger with at least 70A or flash campaign/actions at least 100 A charge current.
- The battery temperature must be at least 10 °C (50 °F).
- Read the ⇒ Battery Charger Operating Instructions .

Procedure

Place the vehicle key and other start authorization systems (such as smartphones) outside of the vehicle interior.

Continuation

- Switch off the ignition.

Tip

Charging the battery takes place in the installed and connected position.

Vehicles with passenger compartment battery

Batteries may be jump started at the jump start connection with a charge current of maximum "50A".

Continuation for all vehicles

- Connect the red charging clamp (+) on the positive terminal of the battery or on the positive terminal grip.
- Connect the black charging clamp (-) on the negative terminal.
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- Turn on the charger.
- After finishing the service work, end the charging process and disconnect the battery charger.

3.3 Severely Discharged Batteries



WARNING

There is the risk of an explosion due to severely discharged batteries. Severe injury is possible.

Do not charge or jump start a severely discharged battery.

Replace the battery.

- ◆ A battery is severely discharged when the resting voltage is lower than 11.6 V.

- ◆ Replace severely discharged batteries in vehicles before registration and delivery. Pre-existing damage cannot be ruled out.
- ◆ Batteries which have not been driven for lengthy periods, are subject to self-discharge.
- ◆ On severely discharged batteries the acid portion has been greatly reduced.
- ◆ Severely discharged batteries become sulfated. The plate surfaces of the batteries harden.

Conditions

- Read the ⇒ Battery Charger Operating Instructions .

Procedure

- Check the resting voltage of the battery. Refer to ⇒ Rep. Gr. 27 ; Resting Voltage, Checking .

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- Pay attention to the required minimum voltage for charging.

- Refer to ⇒ Rep. Gr. 27 ; Battery, Charging .

4 Generator

- ⇒ “4.1 Generator, Checking”, page 29
- ⇒ “4.2 Overview - Generator, Bosch through MY 2000”, page 30
- ⇒ “4.3 Overview - Bosch Generator from 2001”, page 31
- ⇒ “4.4 Voltage Regulator, Removing and Installing, Bosch Generator from 2001”, page 32
- ⇒ “4.5 Overview - Bosch Generator from 2007”, page 33
- ⇒ “4.6 Voltage Regulator, Removing and Installing, Bosch Generator from 2007”, page 34
- ⇒ “4.7 Carbon Brushes, Checking, all Bosch Generators from 2001”, page 34
- ⇒ “4.8 Overview - Generator, Valeo through MY 2000”, page 34
- ⇒ “4.9 Overview - Generator, Valeo from MY 2001”, page 35
- ⇒ “4.10 Voltage Regulator, Removing and Installing, Valeo Generator from 2001”, page 36
- ⇒ “4.11 Carbon Brushes, Checking, Valeo Generator from 2001”, page 37
- ⇒ “4.12 Voltage Regulator, Removing and Installing, Valeo Generator from 2007”, page 37
- ⇒ “4.13 Carbon Brushes, Checking, Valeo Generator from 2007”, page 38
- ⇒ “4.14 Overview - Hitachi Generator”, page 39
- ⇒ “4.15 Voltage Regulator, Removing and Installing - Hitachi Generator”, page 40
- ⇒ “4.16 Carbon Brushes, Checking, Hitachi Generator”, page 41
- ⇒ “4.17 Ribbed Belt Pulley without Freewheel, Removing and Installing”, page 42
- ⇒ “4.18 Ribbed Belt Pulley with Freewheel, Removing and Installing”, page 42
- ⇒ “4.19 Ribbed Belt Pulley with Freewheel, Checking”, page 47

4.1 Generator, Checking

- ⇒ “4.1.1 Generator C , Checking”, page 29

⇒ “4.1.2 Starter Generator C29 , Checking, 0K4 and VH0”
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- ⇒ “4.1.3 Starter Generator C29 , Checking, 0K4 and VH2/VH3”,
page 30

4.1.1 Generator - C- , Checking

Procedure

- Connect the Vehicle Diagnostic Tester .
- Select the **Diagnostic** mode and start the diagnosis.
- Select the **Test plan** tab.
- Select the **Select individual test** button and select the following tree structure consecutively:

- ◆ 12V vehicle electrical system
- ◆ C - Generator - Test
 - Start the selected program and follow the instructions on the Vehicle Diagnostic Tester display.

4.1.2 Starter Generator - C29- , Checking, 0K4 and VH0

Procedure

- Connect the Vehicle Diagnostic Tester .
- Select the **Diagnostic** mode and start the diagnosis.
- Select the **Test plan** tab.
- Select the **Select individual test** button and select the following tree structure consecutively:
 - ◆ 12V vehicle electrical system
 - ◆ C29 - Starter Generator, Checking
- Start the selected program and follow the instructions on the Vehicle Diagnostic Tester display.

4.1.3 Starter Generator - C29- , Checking, 0K4 and VH2/VH3

Procedure

- Connect the Vehicle Diagnostic Tester .
- Select the **Diagnostic** mode and start the diagnosis.
- Select the **Test plan** tab.
- Select the **Select individual test** button and select the following tree structure consecutively:
 - ◆ Diagnostic-capable systems
 - ◆ 00CC - Starter Generator -C29-
 - ◆ 00CC - Partial System Conditions
 - ◆ C29 - Starter Generator, Checking
- Start the selected program and follow the instructions on the Vehicle Diagnostic Tester display.

4.2 Overview - Generator, Bosch through MY 2000

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1 - Bolts

- 1 Nm

2 - Cover

- With three locking tabs

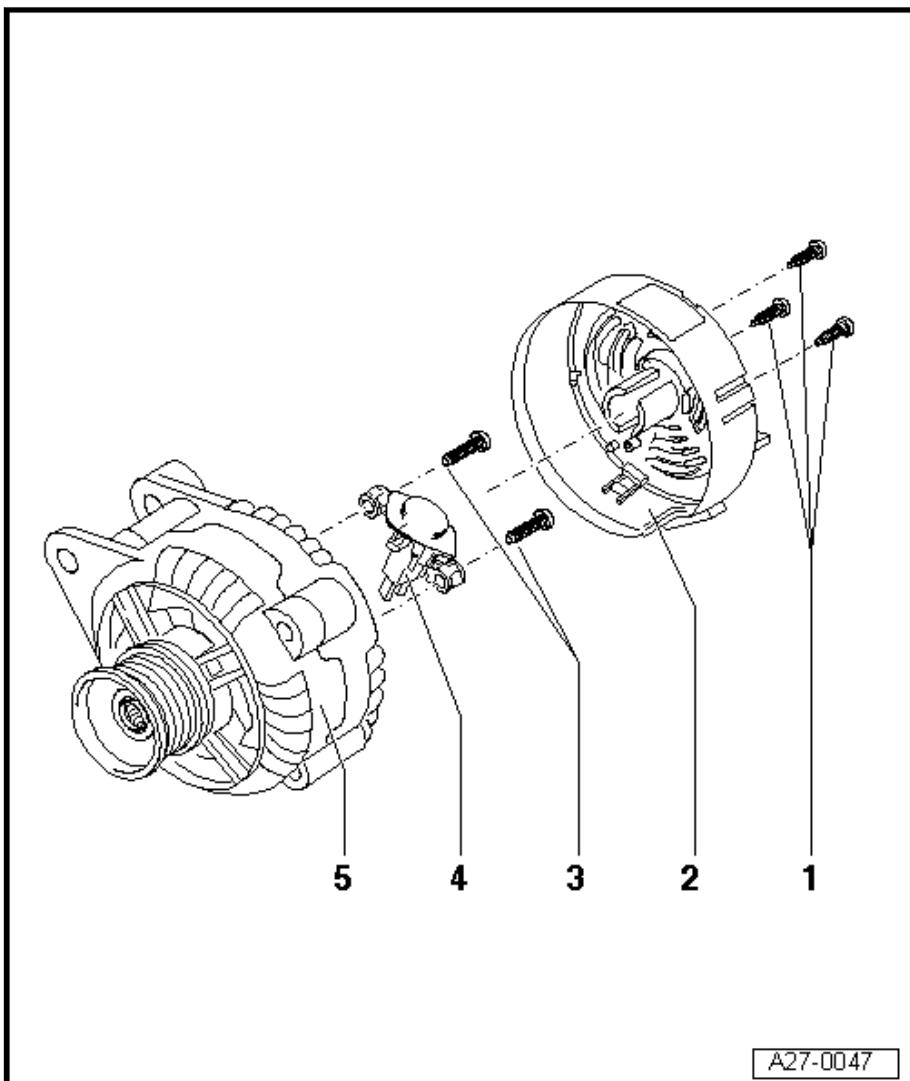
3 - Bolts

- 2 Nm

4 - Voltage Regulator

- Removing
 - Remove the bolts -item 1- and remove the protective cap -item 2-.
 - Remove the bolts -item 3- and remove the voltage regulator.
- Carbon brushes wear limit: 5 mm

5 - Generator



A27-0047

4.3 Overview - Bosch Generator from 2001



Note

The generators were implemented as a running change.

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erWin

1 - Generator

2 - Voltage Regulator

- Removing and Installing. Refer to ⇒ ["4.4 Voltage Regulator, Removing and Installing, Bosch Generator from 2001", page 32](#).
- Carbon brushes, checking. Refer to ⇒ ["4.7 Carbon Brushes, Checking, all Bosch Generators from 2001", page 34](#).

3 - Bolt

- 2.5 Nm

4 - Cover

5 - Nut

- 12 Nm

6 - Nut

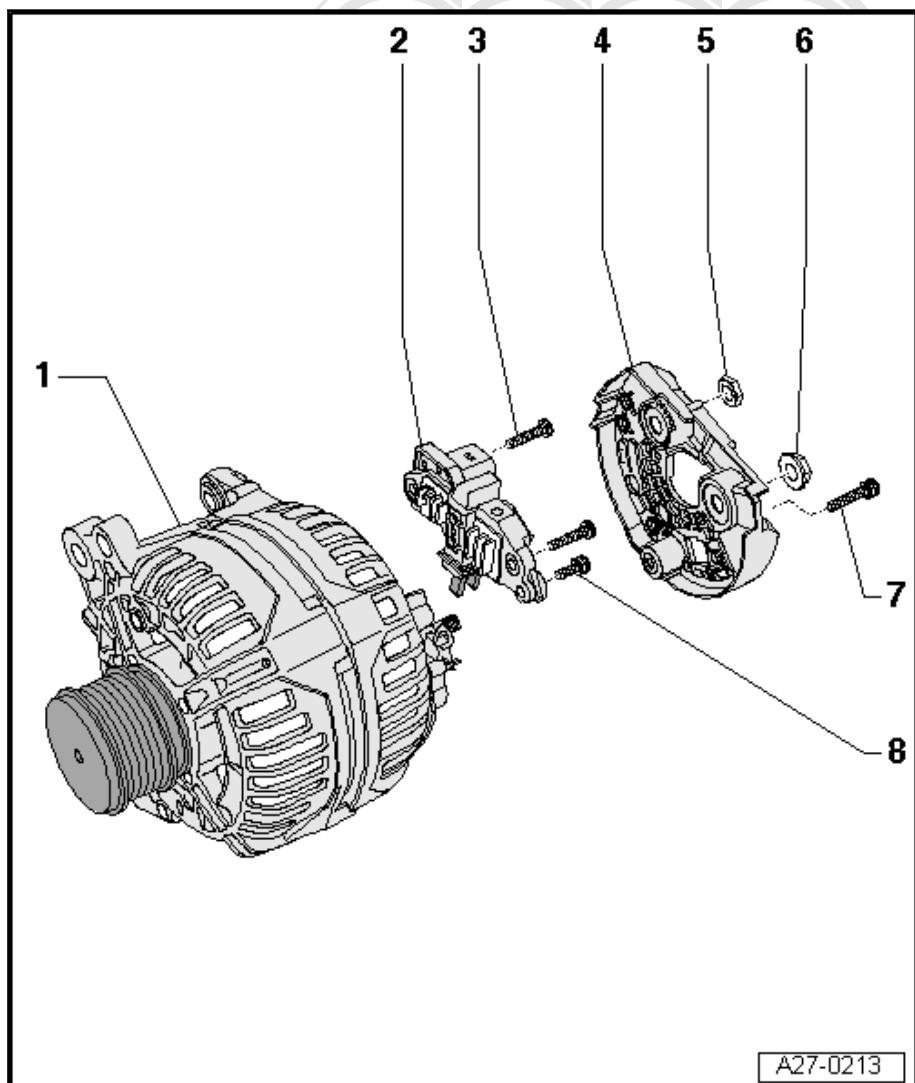
- 30 Nm

7 - Bolt

- 3 Nm

8 - Bolt

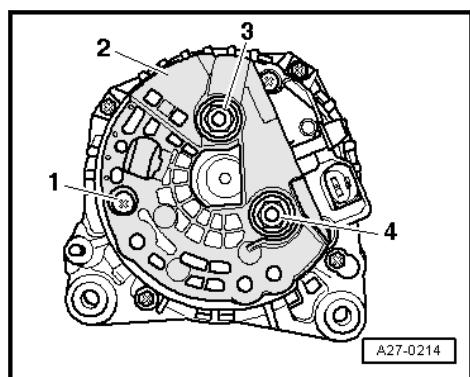
- 1.5 Nm



4.4 Voltage Regulator, Removing and Installing, Bosch Generator from 2001

Removing

- Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Remove the bolt -1- and the nuts -3- and -4-.
- Remove the cover -2- on the rear side of the generator.



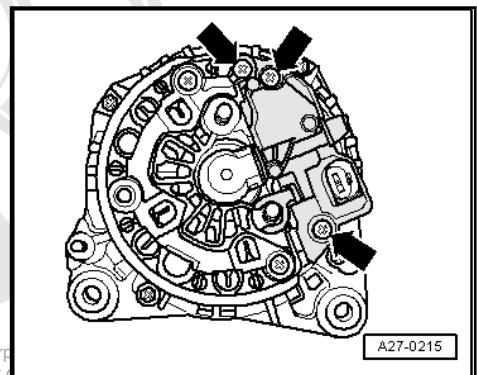
- Remove the screws -arrows-.
- Remove the voltage regulator.

Installing

- When installing the voltage regulator, make sure the carbon brushes rest correctly on the slip rings.

The rest of the installation is performed in reverse order of removal. Note the following:

- Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Tightening specification. Refer to ⇒ [4.3 Overview Bosch Generator from 2001](#), page 31



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4.5 Overview - Bosch Generator from 2007



The new generators are installed as a running change.

1 - Nut

- 65 Nm

2 - Ribbed Belt Pulley

3 - Generator

4 - Voltage Regulator

- Removing and Installing. Refer to ⇒ [“4.6 Voltage Regulator, Removing and Installing, Bosch Generator from 2007”](#), page 34 .
- Carbon brushes, checking. Refer to ⇒ [“4.7 Carbon Brushes, Checking, all Bosch Generators from 2001”](#), page 34 .

5 - Bolt

- 1.5 Nm

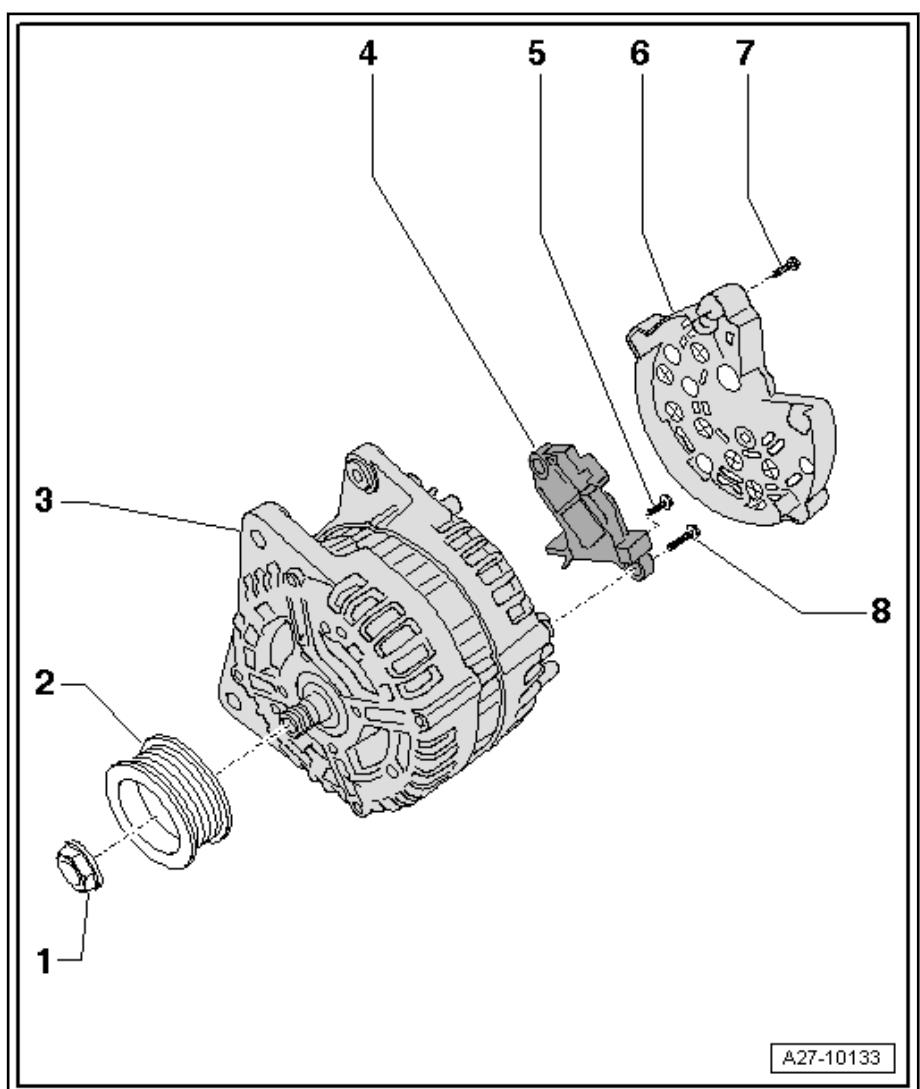
6 - Cover

7 - Bolt

- 3 Nm

8 - Bolt

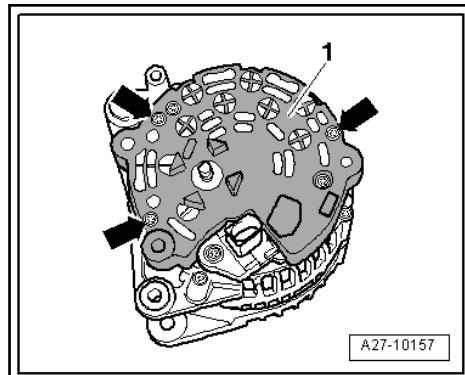
- 2.5 Nm



4.6 Voltage Regulator, Removing and Installing, Bosch Generator from 2007

Removing

- Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Remove the screws -arrows-.
- Remove the cover -1- on the rear side of the generator.



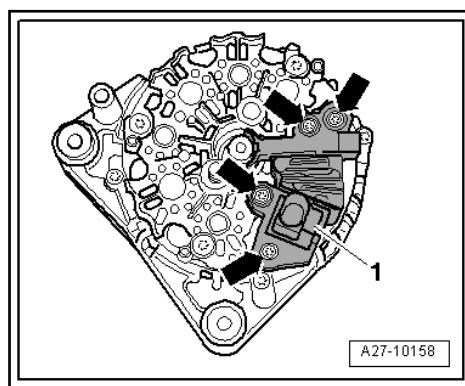
- Remove the screws -arrows-.
- Remove the voltage regulator -1-.

Installing

- When installing the voltage regulator, make sure the carbon brushes rest correctly on the slip rings.

The rest of the installation is performed in reverse order of removal. Note the following:

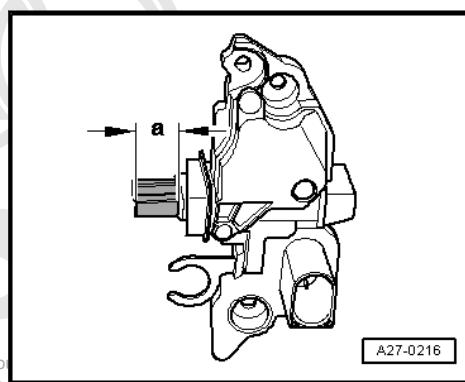
- Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Tightening specification. Refer to ⇒ “4.3 Overview - Bosch Generator from 2001”, page 31 .



4.7 Carbon Brushes, Checking, all Bosch Generators from 2001

Procedure

- Remove the voltage regulator: to 2007 Refer to ⇒ “4.4 Voltage Regulator, Removing and Installing, Bosch Generator from 2001”, page 32 , after 2007 Refer to ⇒ “4.6 Voltage Regulator, Removing and Installing, Bosch Generator from 2007”, page 34 .
- Check the length -a- of the carbon brushes.
- Wear limit: -a- = 5 mm.
- Install the voltage regulator: to 2007 Refer to ⇒ “4.4 Voltage Regulator, Removing and Installing, Bosch Generator from 2001”, page 32 , after 2007 Refer to ⇒ “4.6 Voltage Regulator, Removing and Installing, Bosch Generator from 2007”, page 34 .



4.8 Overview - Generator, Valeo through MY 2000

1 - Generator

2 - Voltage Regulator

Removing

- Remove the nuts
-item 5- and the cover
-item 4-.
- Remove the bolt
-item 6- and the nuts
-item 7- and remove
the voltage regulator.
- Carbon brushes wear
limit: 5 mm

3 - Protective Cap

4 - Cover

5 - Nut

2 Nm

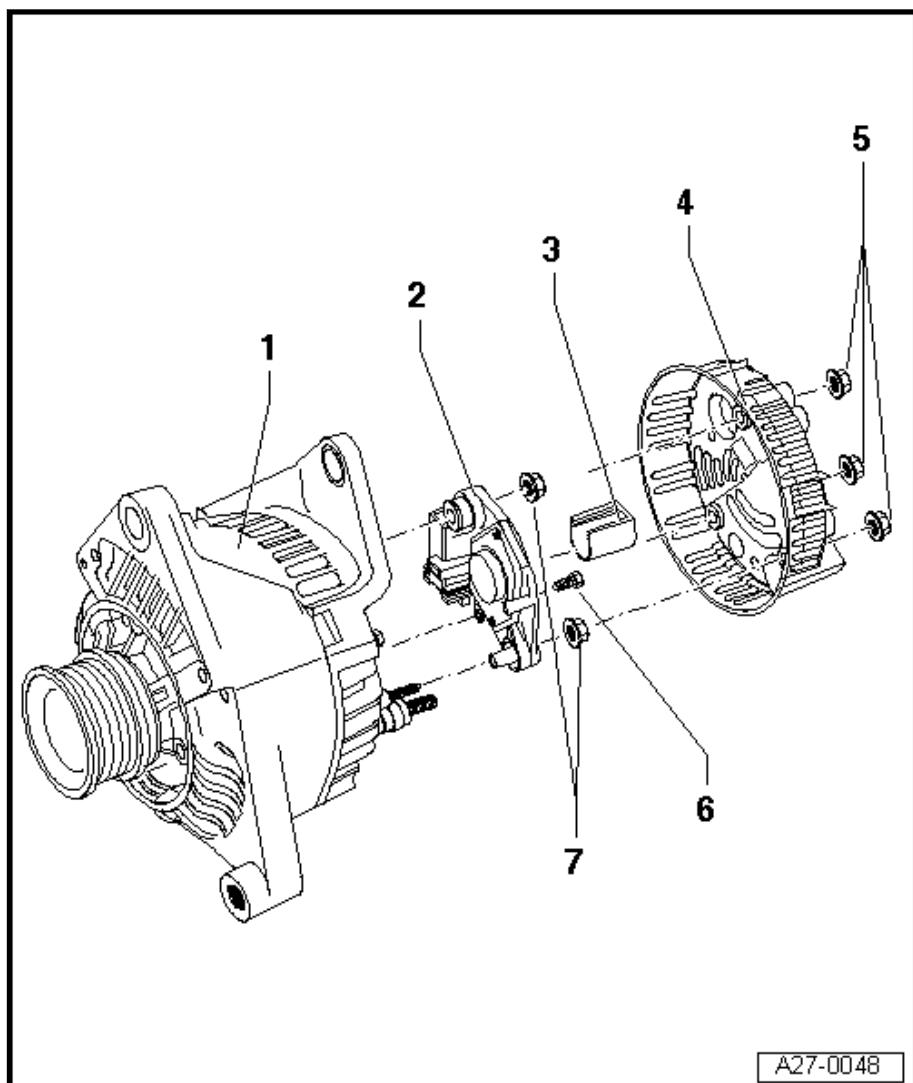
6 - Bolt

2 Nm

7 - Nut

Quantity: 2

3.5 Nm



A27-0048

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4.9 Overview - Generator, Valeo from MY 2001



Note

The generators were implemented as a running change.



1 - Generator

2 - Voltage Regulator

- Removing and installing: to 2007 Refer to [⇒ "4.10 Voltage Regulator, Removing and Installing, Valeo Generator from 2001", page 36](#), after 2007 Refer to [⇒ "4.12 Voltage Regulator, Removing and Installing, Valeo Generator from 2007", page 37](#)
- Check the carbon brushes: to 2007 Refer to [⇒ "4.11 Carbon Brushes, Checking, Valeo Generator from 2001", page 37](#), after 2007 Refer to [⇒ "4.13 Carbon Brushes, Checking, Valeo Generator from 2007", page 38](#)

3 - Bolt

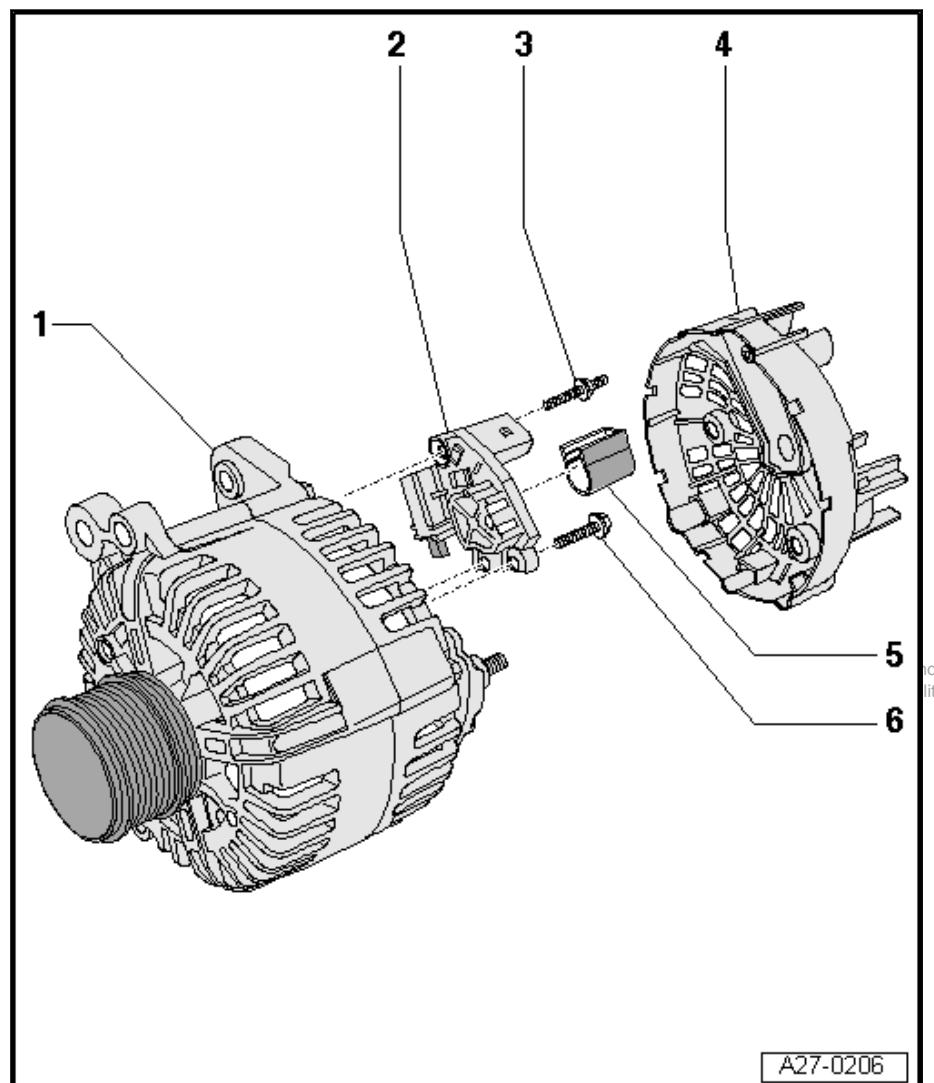
- 2 Nm

4 - Cover

5 - Protective Cap

6 - Bolt

- 2 Nm

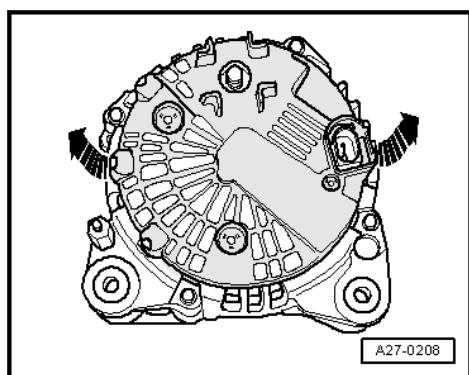


A27-0206

4.10 Voltage Regulator, Removing and Installing, Valeo Generator from 2001

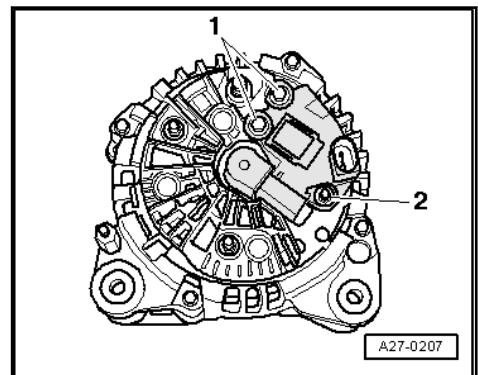
Removing

- Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Press the cover on the rear side of the generator off of the threaded pins -arrows-.



A27-0208

- Remove the bolts -1- and the double bolt -2-.
- Remove the voltage regulator.

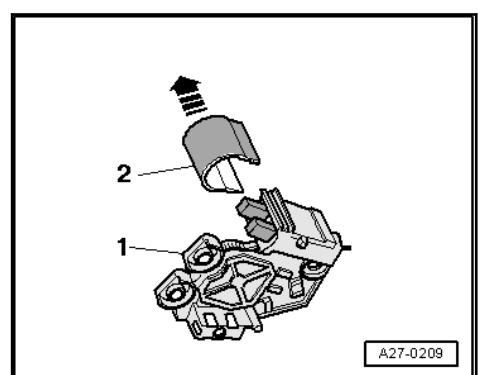


Installing

- Press the protective cap -2- off of the voltage regulator -1- in the -direction of the arrow-.
- When installing the voltage regulator, make sure the carbon brushes rest correctly on the slip rings.
- Install the protective cap with the voltage regulator installed.

The rest of the installation is performed in reverse order of removal. Note the following:

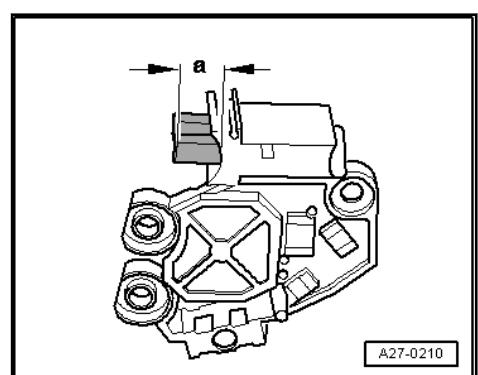
- Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Tightening specification. Refer to ⇒ [“4.9 Overview - Generator, Valeo from MY 2001”, page 35](#) .



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4.11 Carbon Brushes, Checking, Valeo
 Generator from 2001
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Procedure

- Remove the voltage regulator. Refer to ⇒ [“4.10 Voltage Regulator, Removing and Installing, Valeo Generator from 2001”, page 36](#) .
- Check the length -a- of the carbon brushes.
- Wear limit: -a- = 5 mm.
- Install the voltage regulator. Refer to ⇒ [“4.10 Voltage Regulator, Removing and Installing, Valeo Generator from 2001”, page 36](#) .



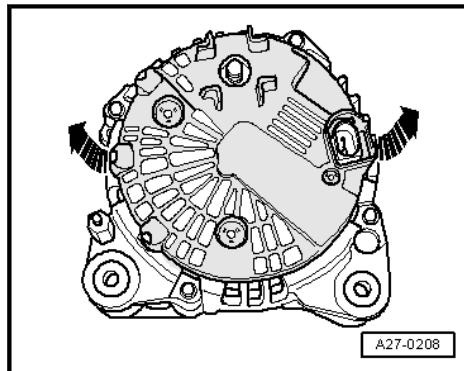
4.12 Voltage Regulator, Removing and Installing, Valeo Generator from 2007

Special tools and workshop equipment required

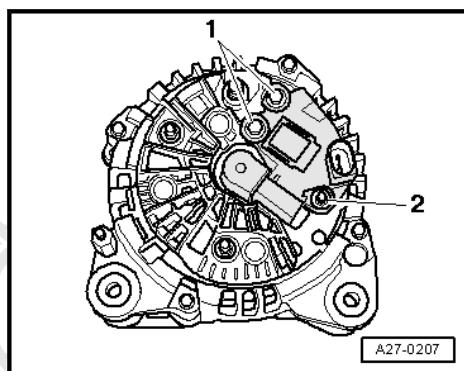
- ◆ Feeler gauge 0.3 mm

Removing

- Remove the generator. Refer to => Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Press the cover on the rear side of the generator off of the threaded pins -arrows-.



- Remove the bolts -1- and the double bolt -2-.
- Remove the voltage regulator.

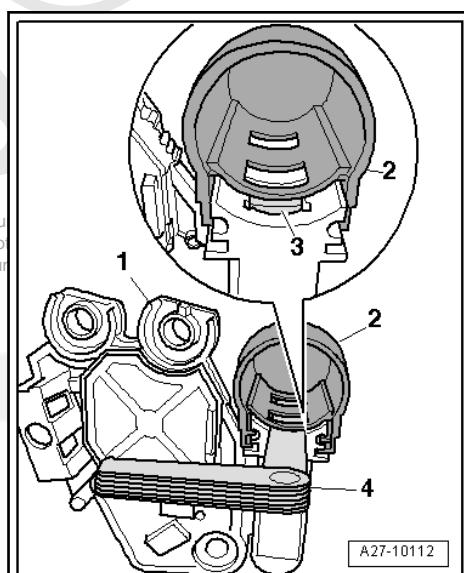


Installing

- Insert a 0.3 mm feeler gauge -item 4- between the protective cap -2- and the carbon brushes -3-.
- Pull the protective cap off until the bar of the protective cap presses the carbon brushes down.
- After installation of the voltage regulator, press the protective cap all the way on.

The rest of the installation is performed in reverse order of removal. Note the following:

- Install the generator. Refer to => Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Tightening specification. Refer to [“4.9 Overview - Generator, Valeo from MY 2001”, page 35](#).



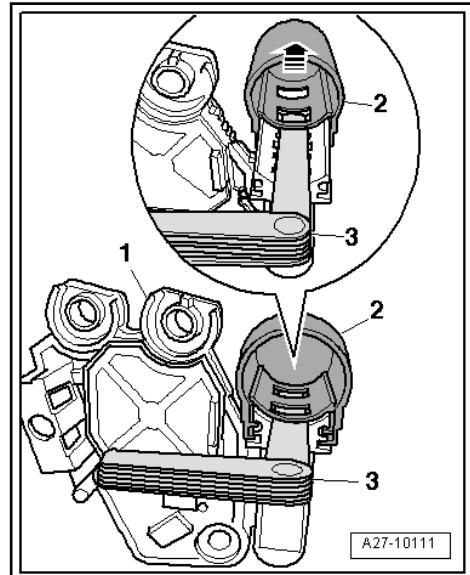
4.13 Carbon Brushes, Checking, Valeo Generator from 2007

Special tools and workshop equipment required

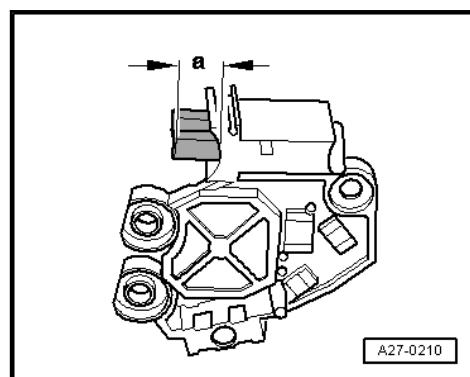
- ◆ Feeler gauge 0.3 mm

Procedure

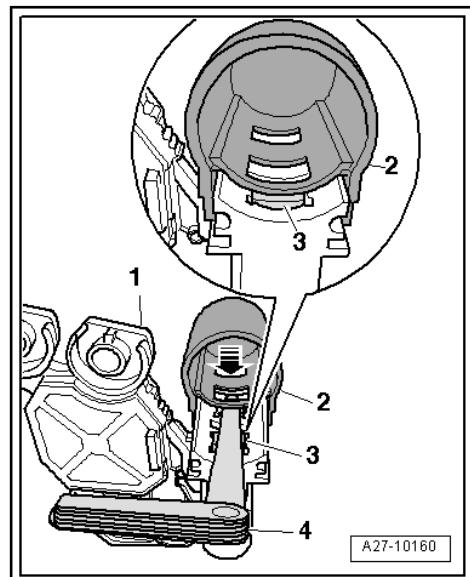
- Remove the voltage regulator. Refer to ["4.12 Voltage Regulator, Removing and Installing, Valeo Generator from 2007"](#), page 37 .
- Insert a 0.3 mm feeler gauge -item 3- between the protective cap -2- and the carbon brushes.
- Remove the protective cap from voltage regulator -1- -arrow-.



- **Check the length -a- of the carbon brushes.**
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- **Wear limit: -a- = 5 mm.**



- With protective cap -2- installed, use feeler gauge -4- to press the carbon brushes -3- down.
- Push the protective cap off -arrow- until the bar of the protective cap presses the carbon brushes down.
- Install the voltage regulator. Refer to ["4.12 Voltage Regulator, Removing and Installing, Valeo Generator from 2007"](#), page 37 .



4.14 Overview - Hitachi Generator

1 - Generator**2 - Bolt**

- Quantity: 4
- 2 Nm

3 - Voltage Regulator

- Removing and Installing. Refer to ["4.15 Voltage Regulator, Removing and Installing - Hitachi Generator", page 40](#).
- Carbon brushes, checking. Refer to ["4.16 Carbon Brushes, Checking, Hitachi Generator", page 41](#).

4 - Nut

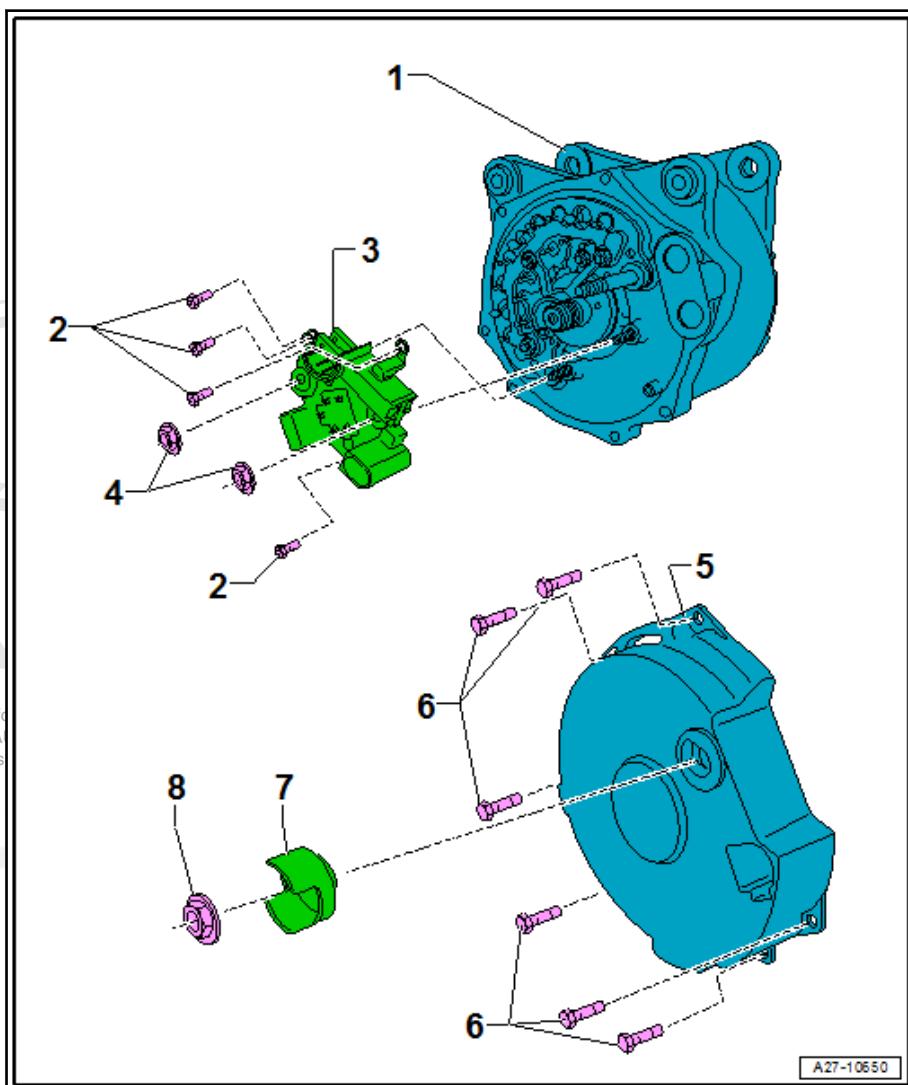
- Quantity: 2
- 4 Nm

5 - Cover**6 - Bolt** Protected by copyright. Copying permitted unless authorised by Audi with respect to the correctness of the document.

- Quantity: 6
- 4 Nm

7 - Protective Cap**8 - Nut**

- 11 Nm



4.15 Voltage Regulator, Removing and Installing - Hitachi Generator

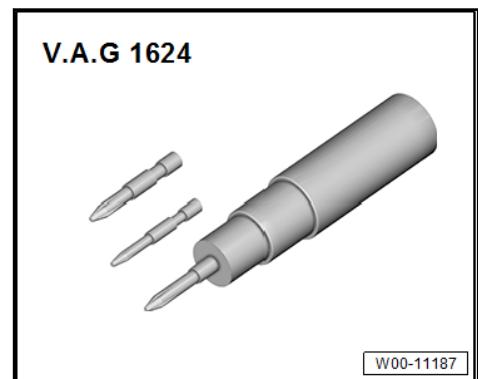
Special tools and workshop equipment required

- ◆ Torque Wrench - V.A.G 1410-

V.A.G 1410

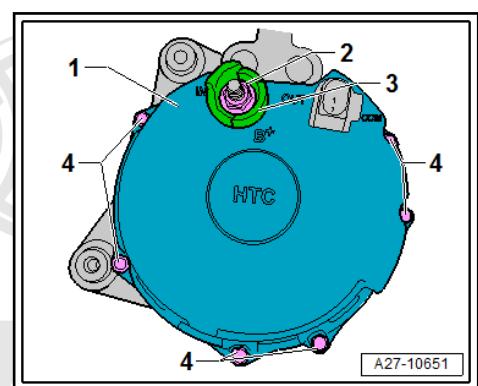
W00-11174

- ◆ Torque Screwdriver - V.A.G 1624-



Removing

- Remove the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- Remove the nut -2-.
- Remove the protective cap -3-.
- Remove the bolts -4-.



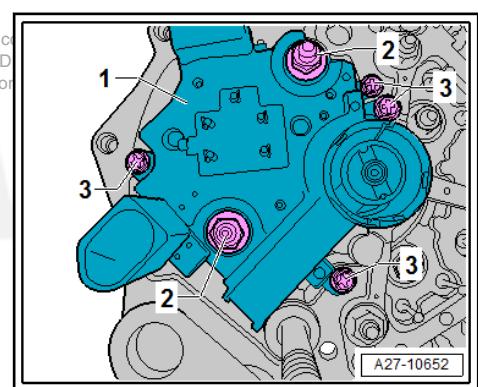
- Remove the cover -1-.
- Remove the bolts -3-.
- Remove the nuts -2-.
- Remove the voltage regulator -1-.

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Installing

Install in the reverse order of removal while noting the following:

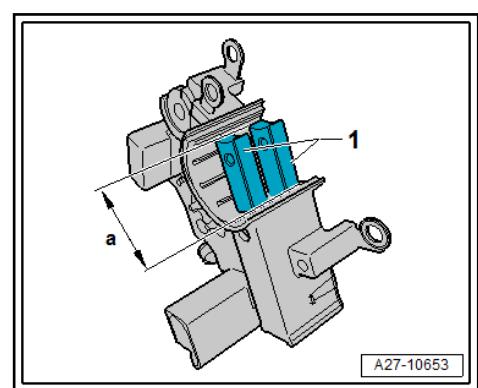
- When installing the voltage regulator, make sure the carbon brushes rest correctly on the slip rings.
- Install the generator. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .



4.16 Carbon Brushes, Checking, Hitachi Generator

Procedure

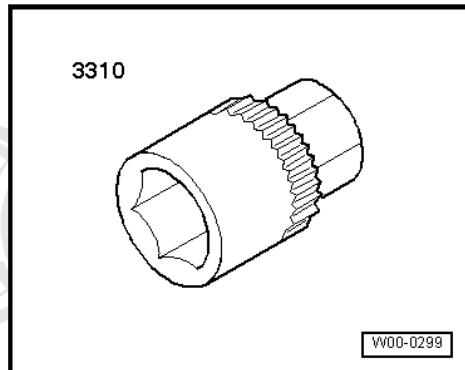
- Remove the voltage regulator. Refer to [“4.15 Voltage Regulator, Removing and Installing - Hitachi Generator”, page 40](#).
- Check the length -a- of the carbon brushes -1-.
 - Wear limit: -a- = 6.5 mm.
- Install the voltage regulator. Refer to [“4.15 Voltage Regulator, Removing and Installing - Hitachi Generator”, page 40](#).



4.17 Ribbed Belt Pulley without Freewheel, Removing and Installing

Special tools and workshop equipment required

- ◆ Generator Belt Socket - 3310-



- ◆ 8 mm Inner Hex Socket or TORX T50

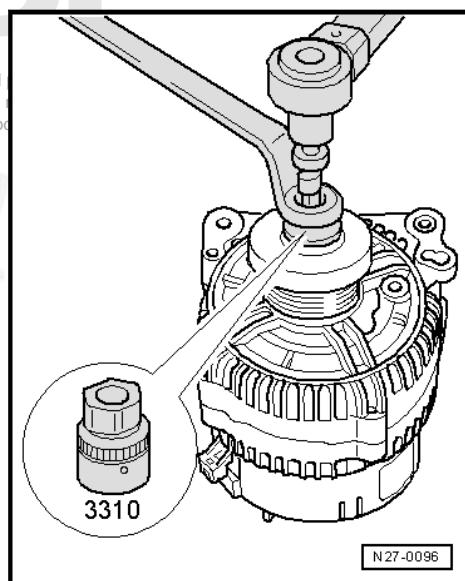
Removing

- Remove the generator, if necessary. Refer to → Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- For some engine types the removal can be performed with the generator still installed, here only the ribbed belt tension must be released and then be removed.
- If present, press the protective cap off the generator pulley.
- Counterhold the nut using the Generator Belt Socket - 3310- and rotate the generator shaft clockwise to loosen it.
- Remove ribbed belt pulley.

Installing

Install in reverse order of removal and note the following:

- Turn the generator shaft counterclockwise to tighten.
- Clip protective cap onto generator pulley.



Tightening Specification

Component	Nm
Ribbed belt pulley to generator	65

4.18 Ribbed Belt Pulley with Freewheel, Removing and Installing

⇒ “4.18.1 Ribbed Belt Pulley with Free-Running Hub, Version 1, Removing and Installing”, page 42

⇒ “4.18.2 Ribbed Belt Pulley with Free-Running Hub, Version 2, Removing and Installing”, page 45

4.18.1 Ribbed Belt Pulley with Free-Running Hub, Version 1, Removing and Installing

General Description

There are different ribbed belt pulley with freewheel.

Before removing, check which special tool must be used for the removal of the ribbed belt pulley with freewheel.



Caution

The length of the ribbed belt is different depending on the ribbed belt pulley with freewheel installed.

Check which ribbed belt pulley with freewheel is installed and make sure that the correct ribbed belt will be installed. For the ribbed belt allocation, refer to the Electronic Parts Catalog (ETKA).

Characteristics of the ribbed belt pulley with freewheel:

-A- small ribbed belt pulley with freewheel, special tool to be used Adapter - T10474- or Multi-Tooth Adapter - 3400-

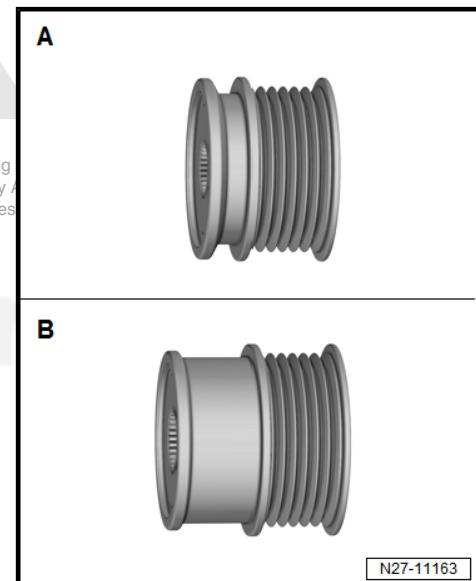
-B- large ribbed belt pulley with freewheel, special tool to be used Multi-Tooth Adapter - 3400-

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Note

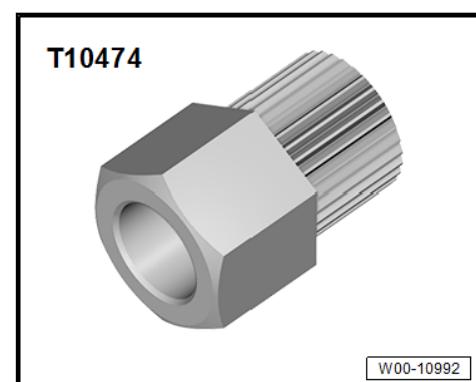
The ribbed belt for the large ribbed belt pulley with freewheel must be larger because it has a larger diameter.



N27-11163

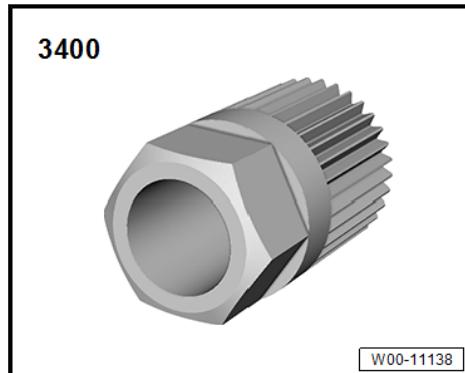
Special tools and workshop equipment required

- ◆ Adapter - T10474-



W00-10992

- ◆ Multi-Tooth Adapter - 3400-



- ◆ Torque Wrench, 40-200Nm - V.A.G 1332A-



- ◆ 8 mm Inner Hex Socket or TORX T50

Removing

- Remove the generator, if necessary. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- For some engine types the removal can be performed with the generator still installed, here only the ribbed belt tension must be released and then be removed.
- Clamp the generator in a vise at the mounting points. Protective jaws must be used to prevent damage to the generator.
- If equipped, remove the protective cap from the decoupling belt pulley with freewheel.
- Install the Adapter - T10474- or Multi-Tooth Adapter - 3400-1- in the belt pulley and attach a wrench.

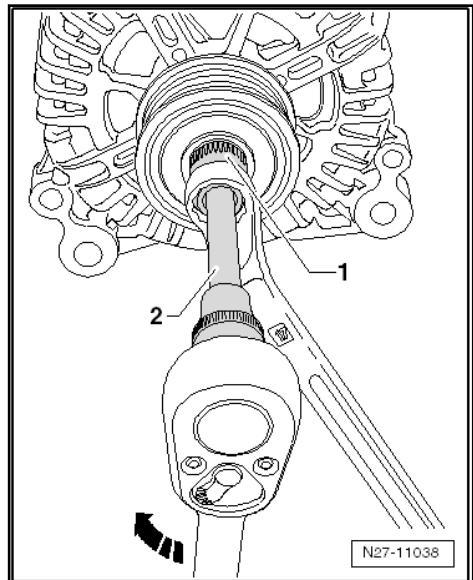
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- Place a suitable tool -2- in the generator shaft.
- Turn the generator shaft clockwise to loosen and counter-hold with the wrench while doing so.
- Hold the ribbed belt pulley with freewheel in place by hand and turn it at the generator shaft, until the ribbed belt pulley with freewheel can be removed.

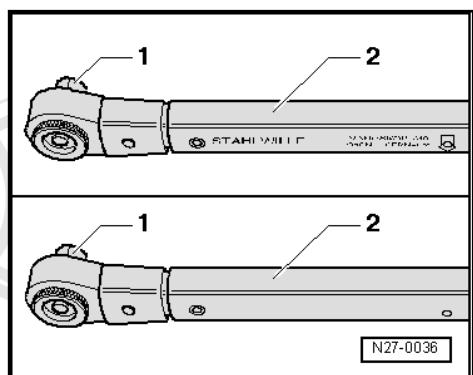
Installing:

Install in reverse order of removal. Note the following:

The Torque Wrench 1332 40-200Nm - V.A.G 1332- must be rearranged as follows to install the decoupling belt pulley with freewheel:



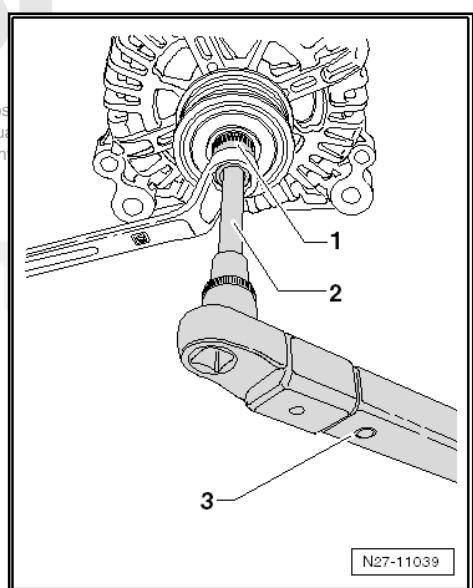
- Release the insert -1- and remove it from the handle part -2-.
- Turn the handle part -2- of the torque wrench 180° and reinsert the socket.
- Set the rotation direction of the torque wrench socket to "left".
- Next, screw the ribbed belt pulley with freewheel by hand all the way onto the generator.
- Install the Adapter - T10474- -1- in the ribbed belt pulley with freewheel and position the wrench.



- Place a suitable tool -2- in the generator shaft.
- Turn the generator shaft using the Torque Wrench 1332 40-200Nm - V.A.G 1332- -3- counter-clockwise to tighten the ribbed belt pulley with freewheel.
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- Clip the protective cap onto generator pulley and pay attention to a correct seating of the protective cap.

Tightening Specification

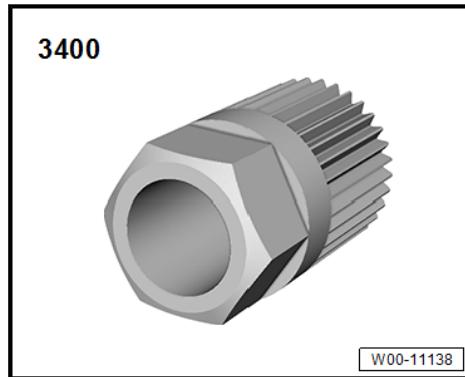
Component	Nm
Ribbed belt pulley with freewheel to generator	80



4.18.2 Ribbed Belt Pulley with Free-Running Hub, Version 2, Removing and Installing

Special tools and workshop equipment required

- ◆ Multi-Tooth Adapter - 3400-



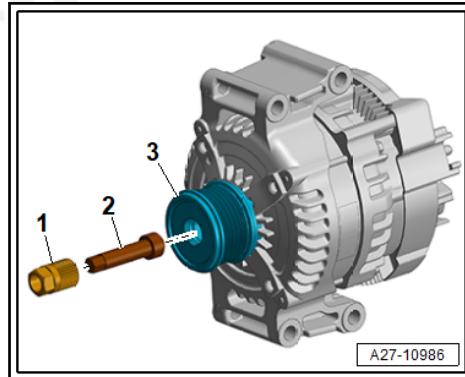
- ◆ Socket - 3400/1-
- ◆ Torque Wrench, 40-200Nm - V.A.G 1332A-



Removing

- Remove the generator, if necessary. Refer to ⇒ Electrical Equipment; Rep. Gr. 27 ; Generator; Generator, Removing and Installing .
- For some engine types the removal can be performed with the generator still installed, here only the ribbed belt tension must be released and then be removed.
- Clamp the generator in a vise **at the mounting points**. Protective jaws must be used to prevent damage to the generator.
- If equipped, remove the protective cap from the decoupling belt pulley with freewheel.
- Slide the Socket - 3400/1- -item 2- onto the generator shaft.
- Insert the Multi-Tooth Adapter - 3400- -item 1- into the belt pulley -3- and attach a wrench.

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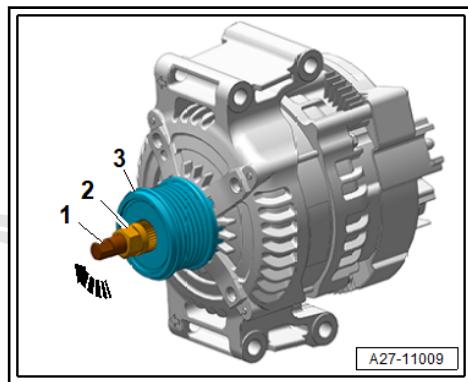


- Loosen the generator shaft using the Socket - 3400/1- -item 1- clockwise -arrow- by counterholding at the Multi-Tooth Adapter - 3400- -item 2- using a wrench.
- Hold the ribbed belt pulley -3- with freewheel in place by hand and turn it at the generator shaft, until the ribbed belt pulley with freewheel can be removed.

Installing:

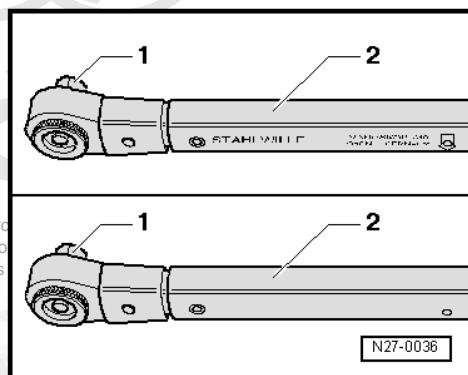
Install in reverse order of removal. Note the following:

The Torque Wrench 1332 40-200Nm - V.A.G 1332- must be rearranged as follows to install the decoupling belt pulley with freewheel:

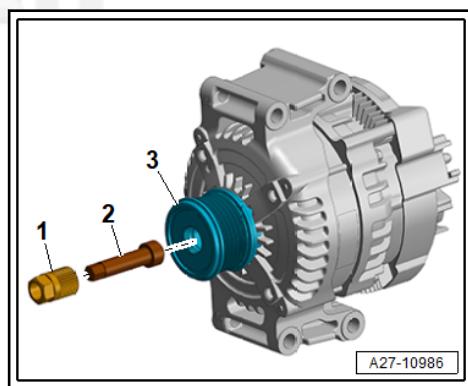


- Release the insert -1- and remove it from the handle part -2-.
- Turn the handle part -2- of the torque wrench 180° and reinsert the socket.
- Set the rotation direction of the torque wrench socket to "left".
- Next, screw the ribbed belt pulley with freewheel by hand all the way onto the generator.

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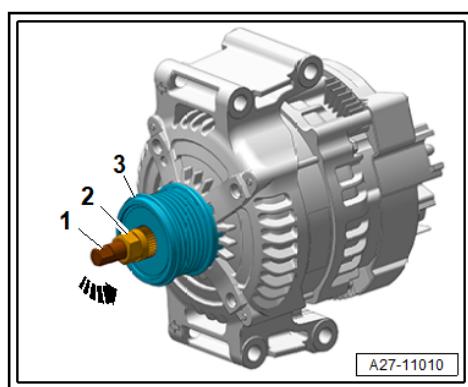
- Slide the Socket - 3400/1- -item 2- onto the generator shaft.
- Insert the Multi-Tooth Adapter - 3400- -item 1- into the belt pulley -3- and attach a wrench.



- Tighten the generator shaft counter-clockwise to the Socket - 3400/1- -item 1-, using the Torque Wrench, 40-200Nm - V.A.G 1332- by counterholding the Multi-Tooth Adapter - 3400- -item 2- using a wrench.
- Clip the protective cap onto generator pulley and pay attention to a correct seating of the protective cap.

Tightening Specification

Component	Nm
Ribbed belt pulley with freewheel to generator	80



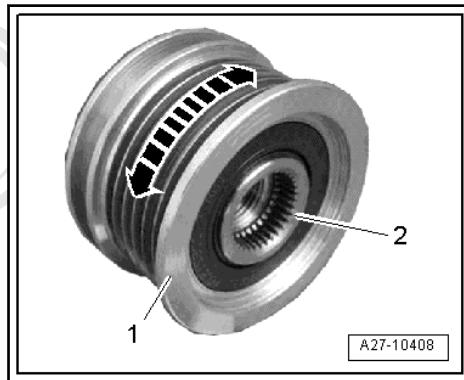
4.19 Ribbed Belt Pulley with Freewheel, Checking

Procedure

- The ribbed belt pulley with freewheel is removed. Refer to [“4.18 Ribbed Belt Pulley with Freewheel, Removing and Installing”, page 42](#).

- Hold the inner ring -2- on the ribbed belt pulley with one hand using the thumb and index finger and the outer ring -1- with the other hand using the thumb and index finger.
- Hold the inner ring tight and turn the outer ring in the rotation direction of the generator.
- If the free-running hub is intact, the outer ring does not turn.
- Hold the inner ring tight and turn the outer ring opposite the rotation direction of the generator.
- If the free-running hub is intact, the outer ring turns with slight resistance.

Replace the ribbed belt pulley if the free-running hub does not function as described.



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92 – Wiper/Washer Systems

1 Washer Fluid Hoses

⇒ “[1.1 Washer Fluid Line Hose Connections, Disconnecting and Connecting](#)”, page 49

⇒ “[1.2 Smooth Hose Washer Fluid Line, Repairing](#)”, page 51

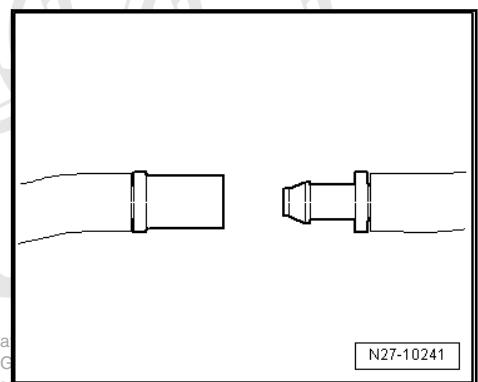
⇒ “[1.3 Corrugated Hose Washer Fluid Line, Repairing](#)”, page 51

1.1 Washer Fluid Line Hose Connections, Disconnecting and Connecting

Various hose couplings are used to connect the hoses to the washer fluid pumps and spray jets or as coupling points.

Unsecured hose coupling

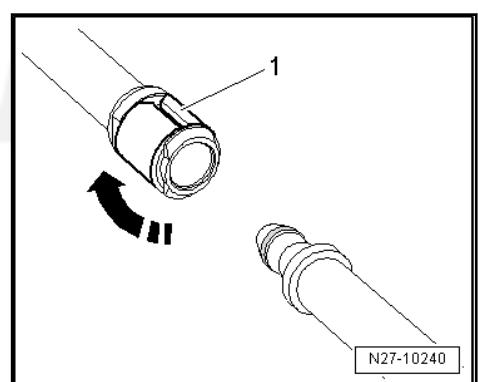
- To disconnect the connection, pull both parts of the coupling apart from each other.
- To connect, press both parts of the coupling together firmly until they noticeably engage.



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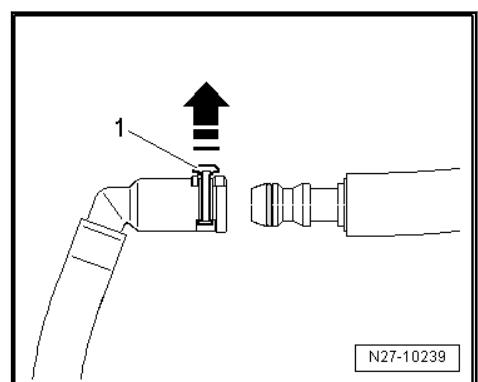
Secured hose coupling with circlip

- To disconnect the connection, turn the circlip -1- 90° -arrow- and remove the hose connector.
- To connect, attach the hose connector and turn circlip -1- -arrow- until it engages.



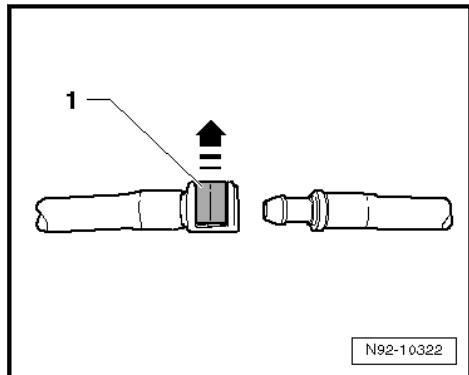
Secured hose coupling with clip, version 1

- To disconnect the connection, pull clip -1- up approximately 1 mm -arrow- and remove the hose connector.
- To connect, attach the hose connector and press the clip in until it engages.



Secured hose coupling with clip, version 2

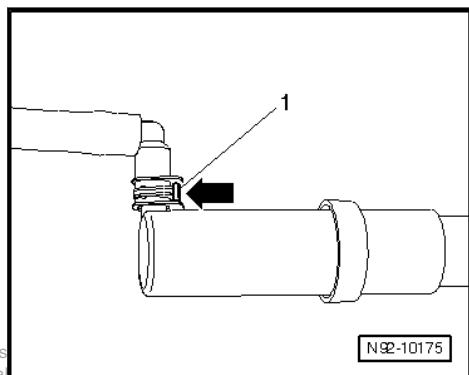
- To disconnect the connection, pull clip -1- up -arrow- and remove the hose connector.
- To connect, attach the hose connector and press the clip in until it engages.



N92-10322

Headlamp washer system hose connection with clip

- To disconnect the connection, press clip -1- -arrow- and remove the hose connector.
- To connect, hold the clip pressed -arrow- and attach the hose connector.
- Make sure the connection is engaged securely by pulling on the hose without pressing the clip.

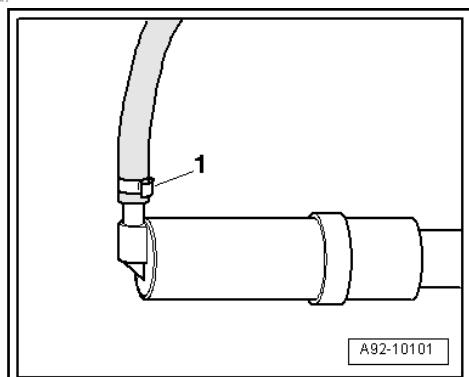


N92-10175

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Headlamp washer system hose coupling with clamp

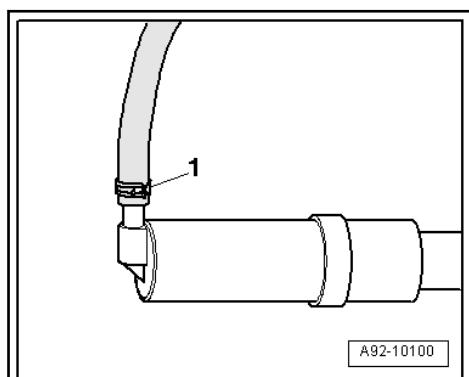
- To disconnect the hose clamp connection -1-, cut with side cutting pliers and remove the hose connector.
- To connect, slide the new clamp onto the hose, connect the hose connection, and install the clamp with Hose Clamp Pliers - V.A.G 1275- .



A92-10101

Headlamp washer system hose connection with spring clip

- To disconnect the connection, open the spring clamp -1- with Hose Clip Pliers - V.A.G 1921- and remove the hose connector.
- To connect, open the spring clamp with Hose Clip Pliers - V.A.G 1921- and attach the connector.



A92-10100

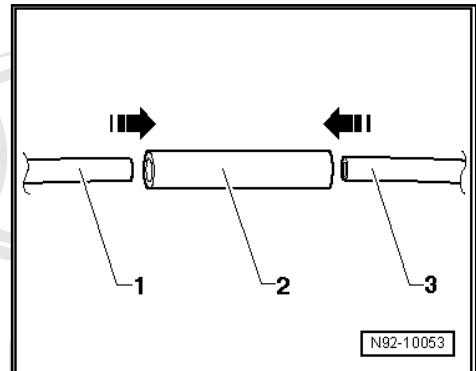
1.2 Smooth Hose Washer Fluid Line, Repairing



Note

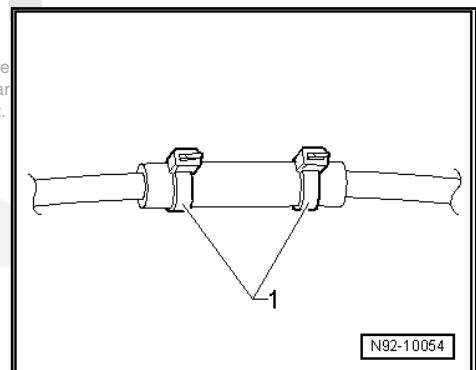
Smooth hoses with a diameter of 5x1 mm or 6x1 mm can be repaired with an EPDM (ethylene propylene diene monomer) hose. Refer to ⇒ Electronic Parts Catalog (ETKA).

- Trim and remove damaged sections of hose.
- Select the appropriate EPDM hose -2- and cable tie. Refer to ⇒ Electronic Parts Catalog (ETKA).
- Extend the EPDM hose -2- so that the smooth tube ends -1- and -3- can each be inserted approximately 10 mm into EPDM hose -2-.



- Secure with cable ties as illustrated -1-.
- Check for function and leaks.

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1.3 Corrugated Hose Washer Fluid Line, Repairing

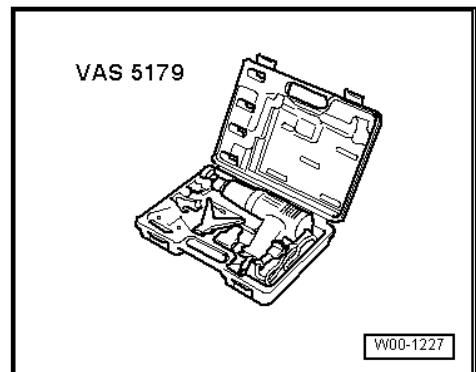


Note

*Corrugated hoses can be replaced with heat-shrinkable tube.
Refer to ⇒ Electronic Parts Catalog (ETKA).*

Special tools and workshop equipment required

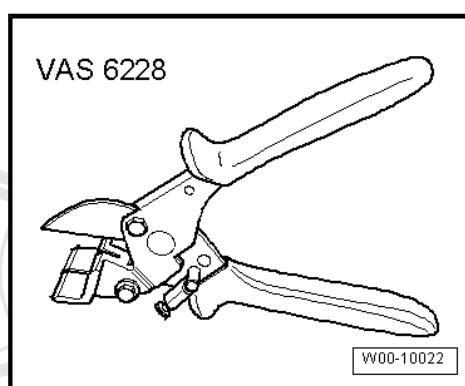
- ◆ Hot Air Blower - VAS 5179- or



- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- from the Wiring Harness Repair Set - VAS 1978 B-



- ◆ Hose Cutting Pliers - VAS 6228A-



Note

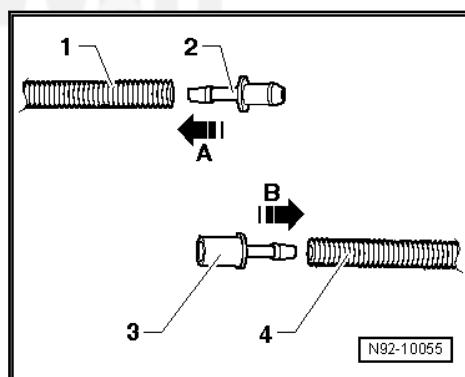
- ◆ Area to be repaired must not be under stress of stretching or bending.

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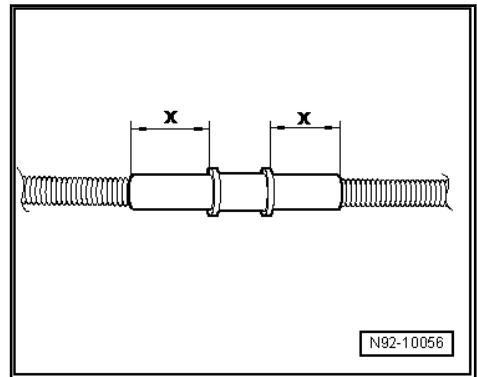
- ◆ If the damaged area is longer than 20 mm, a new section of corrugated hose must be inserted and the procedure described in the following must be performed twice.

Procedure

- Disconnect the damaged part of the washer fluid hose with the Hose Cutting Pliers - VAS 6228- .
- Choose matching repair adapters -2- and -3- as well as appropriate heat-shrink tubing from the ⇒ Electronic Parts Catalog (ETKA) .
- Warm the end of the corrugated tube -1- using the Hot Air Blower - VAS 5179- .
- Press the connecting piece -2- into the corrugated tube -1- -arrow A-.
- Warm the end of the corrugated tube -4- using the Hot Air Blower - VAS 5179- .
- Push the connecting piece -3- in the corrugated tube -4- -arrow B-.



- Trim the heat-shrink sleeve so that corrugated tube is covered on both sides with a minimum of 20 mm -dimension x- of heat-shrink sleeve.
- Slide the heat-shrink tubing over the corrugated tube, attach the connecting pieces together and secure the repair area with heat-shrink tubing.
- The heat-shrink sleeve must be heated from the center outward until it seals completely.
- Set the hot air gun to the correct temperature according to the operating instructions.
- When shrinking, ensure no other lines, plastic parts or insulation material is damaged by the hot nozzle.
- Check for function and leaks.



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94 – Exterior Lights, Switches

1 HID Headlamps Usage and Safety Precautions

Never replace bulbs if not familiar with the procedures, safety precautions and tools.



WARNING

Extremely dangerous due to high-voltage.

- ◆ When working on HID headlamp components marked with yellow high-voltage symbols, these components must be de-energized.
- ◆ Turn off the ignition and all electrical equipment and remove the ignition key.
- ◆ Do not operate the flashers.
- ◆ The HID headlamp control module must never be operated without an HID headlamp bulb.
- ◆ Due to the high-voltage (over 28000 V when switching on the HID headlamp bulb), the HID headlamp bulb may only be operated in the headlamp housing.

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WARNING

Risk of injury from burning, UV radiation, blinding and explosions.

- ◆ Due to the high temperatures, absorption of UV radiation, and the risk of blinding, the HID headlamp bulb may only be operated in the headlamp housing.
- ◆ Do not look into the beam of light. It may impair the ability to see for a significant period of time.
- ◆ HID headlamp bulbs are under pressure and can crack when changing a bulb.
- ◆ Always wear protective eyewear and gloves when removing and installing HID headlamp bulbs.



WARNING

There is a pollution risk.

- ◆ HID headlamp bulbs are hazardous waste. They contain metallic mercury (Hg) and traces of thallium.
- ◆ Do not destroy HID headlamp bulbs and avoid contact with burst bulb glass.
- ◆ Follow all waste disposal regulations and only dispose of HID headlamp bulbs in suitable containers at an authorized collection site.



Caution

- ◆ *Do not touch the HID headlamp bulb glass with bare hands. The remaining fingerprint would evaporate due to the heat of the operated bulb and condense on the reflector which would impair headlamp luminosity. Use clean cloth gloves to insert the HID headlamp bulb.*
- ◆ *Only replace faulty HID headlamp bulbs with a HID headlamp bulbs of the same version. Bulb identification can be found on the bulb socket or on the bulb glass.*
- ◆ *Connectors must engage correctly during installation and make sure the connection is secure.*



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96 – Interior Lights, Switches

1 Anti-Theft Immobilizer

- ⇒ “1.1 General Information”, page 56
- ⇒ “1.2 Faulty Transponder or Lost Key”, page 56
- ⇒ “1.3 Induction Coil, Replacing”, page 57
- ⇒ “1.4 Lock Set, Replacement Procedure”, page 57

1.1 General Information

The anti-theft immobilizer system control module can depending on the vehicle be integrated in the following systems:

- ◆ Instrument Cluster Control Module - J285-
- ◆ Comfort System Central Control Module - J393-
- ◆ Access/Start Authorization Control Module - J518-
- ◆ Vehicle Electrical System Control Module - J519-

Additionally depending on the vehicle the immobilizer contains following control modules:

- ◆ Engine Control Module - J623- / Engine Control Module 2 - J624-
- ◆ Transmission Control Module - J217-
- ◆ Electrical Drive Control Module - J841-
- ◆ Electronic Steering Column Lock Control Module - J764-
- ◆ Data Bus on Board Diagnostic Interface - J533-
- ◆ Control Module for Emergency Call Module and Communication Unit - J949-

- If the control module is replaced, select in the “Off-board Diagnostic Information System Service” the “control module replacing” function of the respective control module on the ⇒ Vehicle diagnostic tester.

1.2 Faulty Transponder or Lost Key

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- ◆ The transponder is integrated in the ignition key and cannot be replaced separately.
- ◆ If the transponder is faulty, the entire ignition key or the transmitter must be replaced.
- Order a replacement key through the distributor or importer with the transmitter with the vehicle-specific lock number using the VIN.

Immobilizer generation 1, 2, 3 and 4:

- Perform in the “Off-board Diagnostic Information System Service” the function “vehicle key adaptation” or “vehicle key, immobilizer programing” from the ⇒ Vehicle diagnostic tester.
- All vehicle keys must be adapted.

Immobilizer from generation 5:

- Perform in the “Off-board Diagnostic Information System Service” the “immobilizer, servicing” and adapt the program to the vehicle key in the ⇒ Vehicle diagnostic tester.

- All vehicle keys must be adapted.

1.3 Induction Coil, Replacing

Vehicles with a mechanical ignition lock:

- ◆ The reader coil is integrated in the lock cylinder and cannot be replaced separately.
- ◆ If induction coil is faulty, entire lock cylinder must be replaced.
- Order a lock cylinder through the distributor or importer using the VIN.

Vehicles with Access/Start Authorization Switch - E415-

- ◆ The reader coil is integrated in the Access/Start Authorization Switch - E415- and cannot be replaced separately.
- ◆ If the induction coil is malfunctioning, the Access/Start Authorization Switch - E415- must be replaced.

Vehicles without an ignition lock:

- ◆ The induction coil is separate and can be replaced separately.

1.4 Lock Set, Replacement Procedure

Immobilizer generation 1, 2 and 3.

- Perform in the “Off-board Diagnostic Information System Service” the function “vehicle key adaptation” or “vehicle key, immobilizer programing” from the ⇒ Vehicle diagnostic tester.
- All vehicle keys must be adapted.
- For anti-theft immobilizer generation 3, the Engine/Motor Control Module - J623- and the Instrument Cluster Combination Processor - J218- or the Instrument Cluster Control Module - J285- must also be replaced when replacing the lock set.

Immobilizer generation 4

- Perform in the “Off-board Diagnostic Information System Service” the “immobilizer activating/new identity” or “New Identity” in the ⇒ Vehicle diagnostic tester.
- All vehicle keys must be adapted.

Immobilizer from generation 5

- Perform in the “Off-board Diagnostic Information System Service” the “immobilizer, servicing” and adapt the program to the vehicle key in the ⇒ Vehicle diagnostic tester.
- All vehicle keys must be adapted.



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2 Trailer Hitch

⇒ “2.1 Trailer Hitch Socket, Removing and Installing, Version 1”,
page 58

⇒ “2.2 Trailer Hitch Socket, Removing and Installing, Version 2”,
page 59

⇒ “2.3 Trailer Hitch Socket, Removing and Installing, Version 3”,
page 61

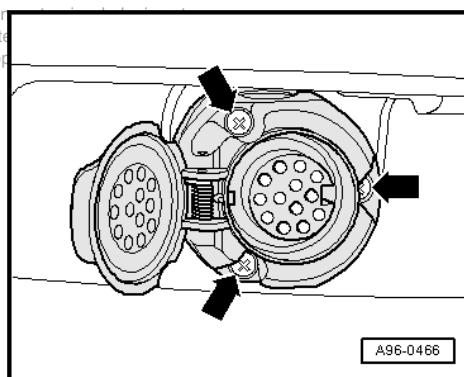
⇒ “2.4 Trailer Hitch Socket, Removing and Installing, Version 4”,
page 62

2.1 Trailer Hitch Socket, Removing and Installing, Version 1

Removing

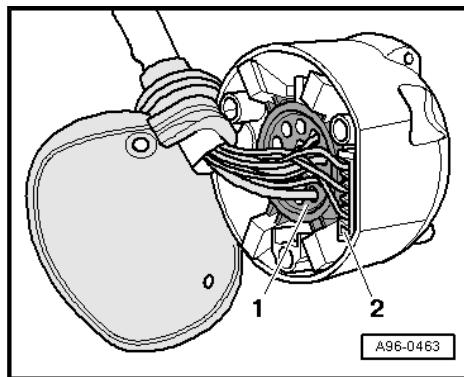
- Turn off the ignition and remove the ignition key.
- Remove the screws -arrows-.
- Detach the socket from the retaining plate.

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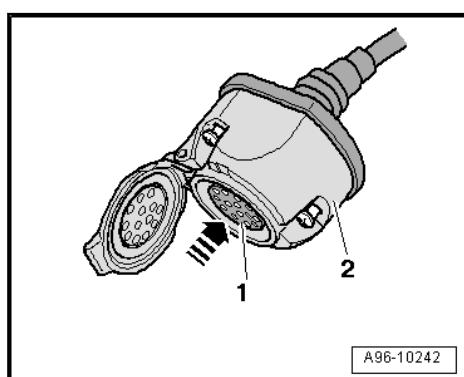
Socket with Rear Fog Lamp Shut-Off Contact Switch - F216- :

- Remove the connector -2- for the Rear Fog Lamp Shut-Off Contact Switch - F216- and connector -1- from the Trailer Socket - U10- .



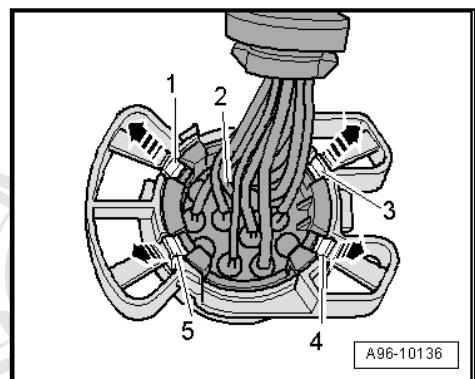
Socket without a Rear Fog Lamp Shut-Off Contact Switch - F216- :

- Press multiple connector -1- in the -direction of the arrow- out of socket -2-.



Version 1:

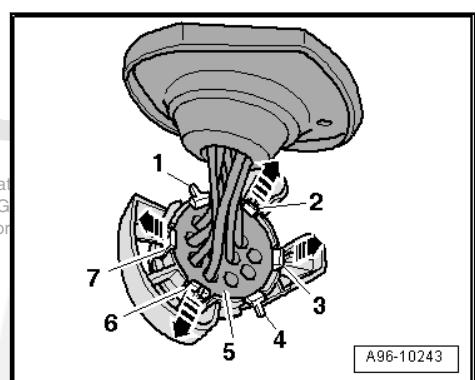
- Release securing tabs -arrows- and then release retainer clips -1- and -3 through 5-.
- Remove the retainer from the connectors -2-.



Version 2:

- First release securing tabs -arrows- and then clips -1, 2, 3, 4, 6 and 7-.
- Remove retaining cage from multi-pin electrical connector -5-.

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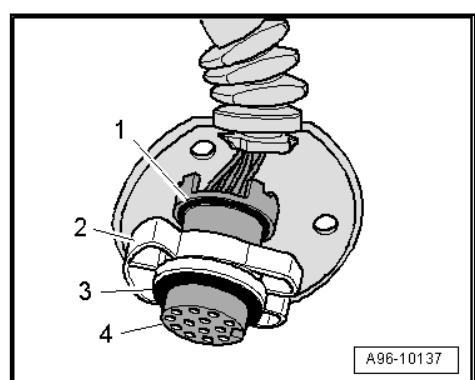
Installing

Install in reverse order of removal and note the following:



Make sure the O-rings -1- and -3- are not damaged.

- Slide the connectors -4- into the retainer -2- until they click into place.



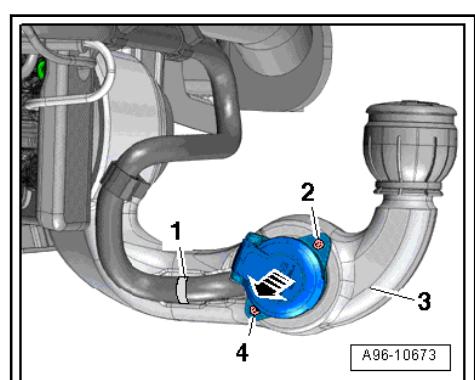
2.2 Trailer Hitch Socket, Removing and Installing, Version 2

Removing

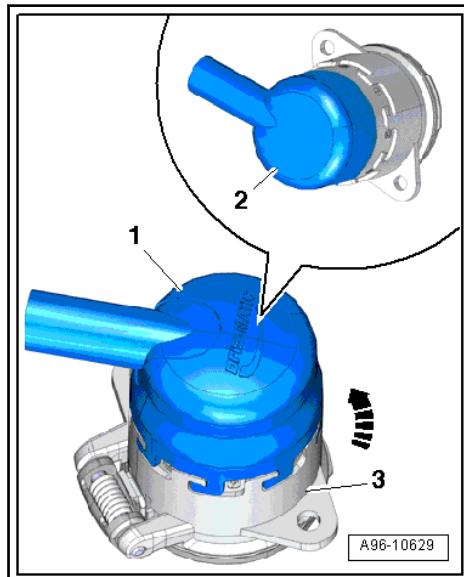


During installation, the cable ties must be installed at the same location.

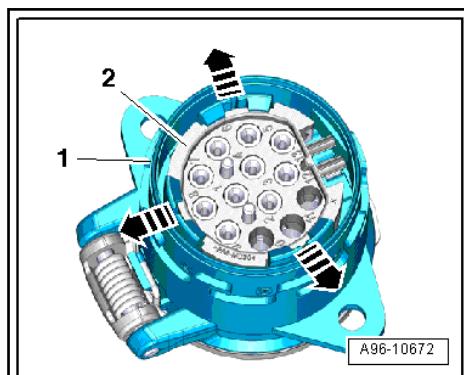
- Turn off the ignition and remove the ignition key.
- Unfold and engage the trailer hitch.
- Cut cable ties -1- and unscrew screws -2- and -4-.
- Press the socket out of trailer hitch -3- in the -direction of the arrow-.



- Turn the cap -1- counterclockwise -arrow- and remove it from the socket -3-.
- Remove the rubber cover -2-.



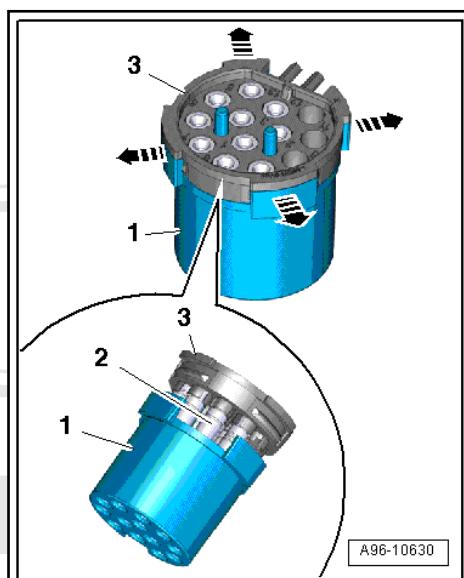
- Release the clips -arrows- and press multiple connector -2- out of socket -1-.



- Release the clips -arrows- and remove the retainer -1- from the multi-pin connector -3-.

 **Note**

Carefully remove the retainer so that contacts -2- of the multiple connector are not disconnected from the wiring harness.

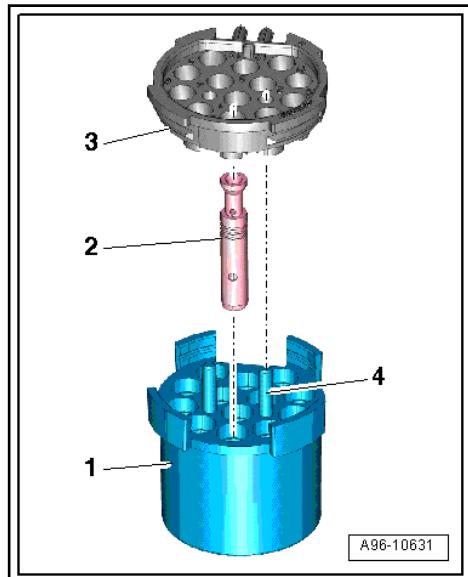


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Installing

Install in reverse order of removal and note the following:

- The retainer -1- can be pushed onto multiple connector -3- in only one position.
- Guide pins -4- can be inserted into the retainer in only one position. Contacts -2- must be inserted in the retainer for this purpose.
- Insert the retainer into the multiple connector until it engages audibly.



2.3 Trailer Hitch Socket, Removing and Installing, Version 3

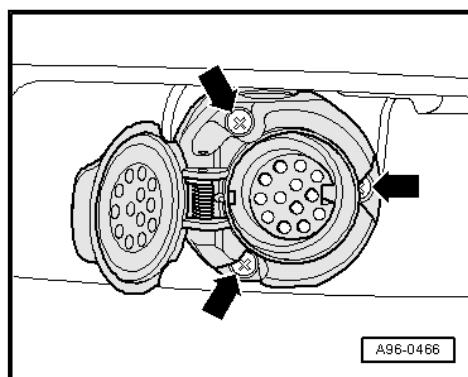
Removing

- Fold out the trailer hitch. Refer to the vehicle ⇒ Owner's Manual .

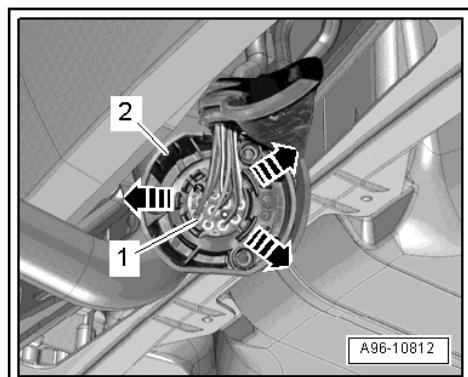
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- Remove the bolts -arrows-.

- Remove the socket from the retaining plate.
- Remove the rubber cover from the socket.



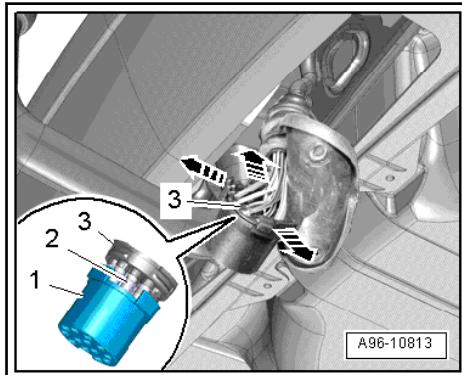
- Release the clips -arrows- and push the multi-pin connector -1- out of the socket -2-.



- Release the clips -arrows- and remove retainer -2- from multiple connector -3-.



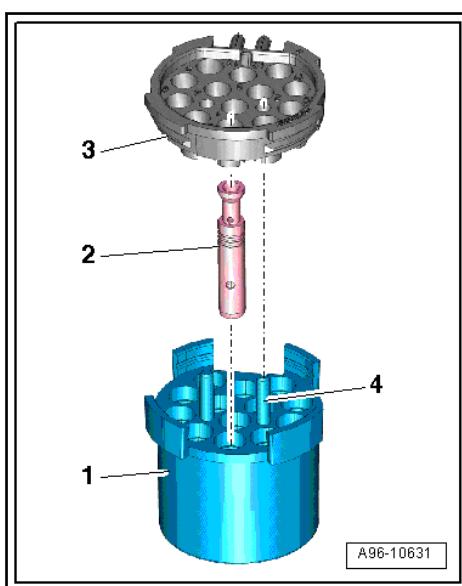
Carefully remove the retainer so that contacts -2- of the multiple connector are not disconnected from the wiring harness.



Installing

Install in reverse order of removal and note the following:

- The retainer -1- can be pushed onto multiple connector -3- in only one position.
- Guide pins -4- can be inserted into the retainer in only one position. Contacts -2- must be inserted in the retainer for this purpose.
- Insert the retainer into the multiple connector until it engages audibly.



2.4 Trailer Hitch Socket, Removing and Installing, Version 4

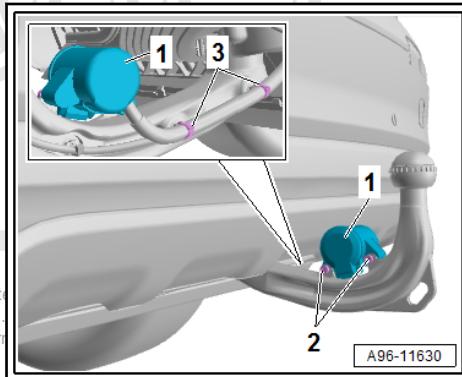
Removing



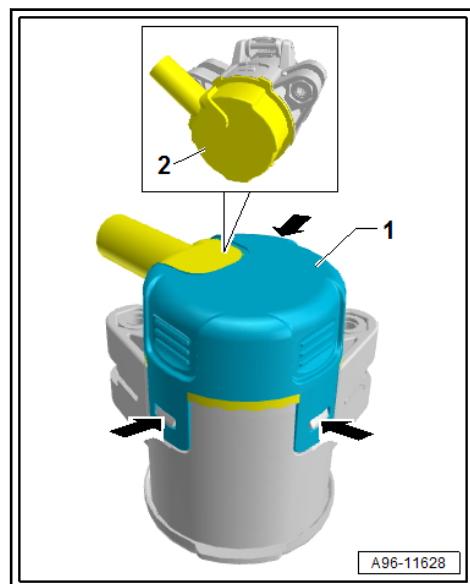
During installation, the cable ties must be installed at the same location.

- Turn off the ignition and all electrical equipment.
- Move out the trailer hitch.
- Cut through the cable tie -3-.
- Remove the bolts -2-.
- Remove the socket from the trailer hitch -1-.

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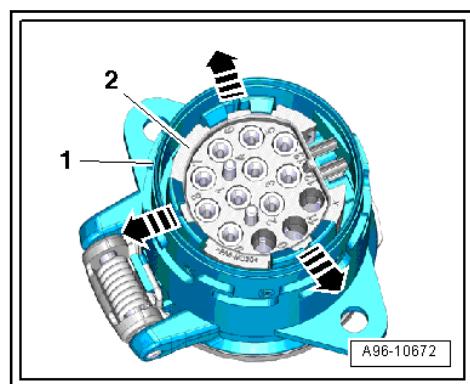


- Release the retainers -arrows-.
- At the same time remove the cap -1- from the socket.
- Remove the rubber cover -2-.



A96-11628

- Release the clips -arrows- and press multiple connector -2- out of socket -1-.



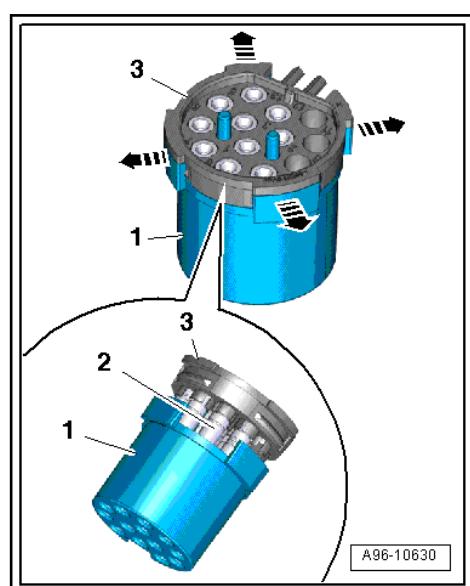
A96-10672

- Release the clips -arrows- and remove the retainer -1- from the multi-pin connector -3-.



Note

Carefully remove the retainer so that contacts -2- of the multiple connector are not disconnected from the wiring harness.



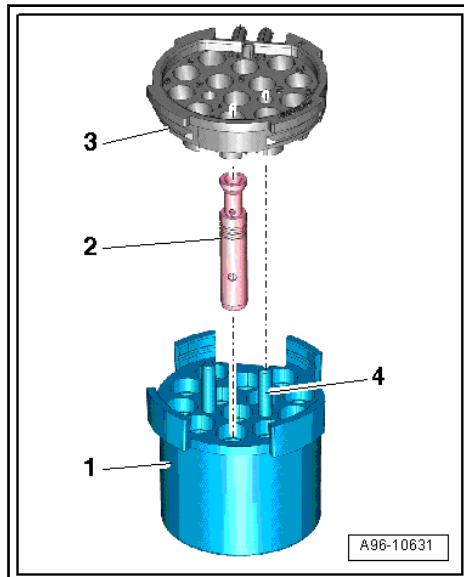
A96-10630

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Installing

Install in reverse order of removal and note the following:

- The retainer -1- can be pushed onto multiple connector -3- in only one position.
- Guide pins -4- can be inserted into the retainer -1- in only one position. Contacts -2- must be inserted in the retainer for this purpose.
- Insert the retainer into the multiple connector until it engages audibly.



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97 – Wiring

1 Vehicle Diagnostic Tester

⇒ [“1.1 Connect the Vehicle Diagnostic Tester”, page 65](#)



WARNING

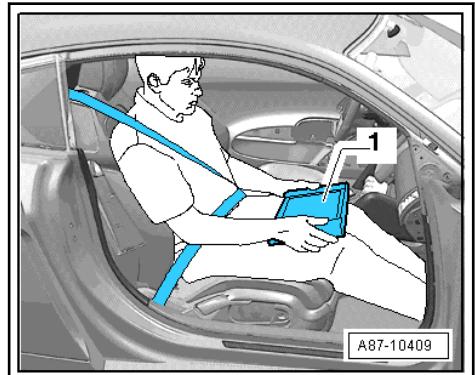
- ◆ During road tests using a vehicle diagnostic and information system, there is the hazard of extreme to lethal injuries!
- ◆ If vehicle diagnostic and information system is deposited in the action area of an airbag during a road test, here is the hazard of extreme to lethal injuries in the event the airbag deploys! copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability in respect of such unauthorised copying or in respect of any damages arising thereof.
- ◆ During road tests, have a person sitting in the rear seat to operate the vehicle diagnostic and information system.

Audi TT and Audi R8



WARNING

- ◆ During road tests using a vehicle diagnostic and information system, there is the hazard of extreme to lethal injuries!
- ◆ If vehicle diagnostic and information system is deposited in the action area of an airbag during a road test, here is the hazard of extreme to lethal injuries in the event the airbag deploys!
- ◆ During road tests, have a technician sit in the front passenger seat in the rearmost position to operate the vehicle diagnostic tester.
- ◆ The vehicle diagnostic tester -1- must lie flat on the passenger's legs and be operated by that person, as shown in the illustration.



- Connect the Vehicle Diagnostic Tester . Refer to ⇒ [“1.1 Connect the Vehicle Diagnostic Tester”, page 65](#) .

1.1 Connect the Vehicle Diagnostic Tester

Special tools and workshop equipment required

- ◆ Vehicle Diagnostic Tester and diagnostic cable

Procedure

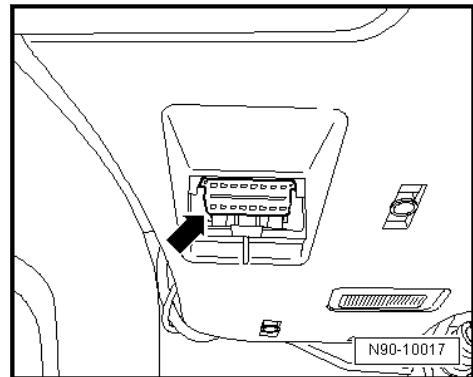
- Engage the parking brake or operate the electromechanical parking brake.
- Shift the shifter lever into neutral or place the selector lever in the “P” position.
- Connect the battery charger to support the vehicle battery. Refer to ⇒ Battery Charger Operating Instructions .

- Turn off the ignition and connect the Vehicle Diagnostic Tester to the diagnostic connection with the diagnostic cable -arrow-.
- When using the Remote Diagnosis Head - VAS 5054 A- or the Diagnosis Interface - VAS 5055- , refer to the ⇒ Operating Instructions (Installation and Startup) .
- Switch the ignition on.
- Switch off all electrical equipment.



Note

If an error message appears on the screen of the Vehicle Diagnostic Tester, refer to the ⇒ Operating Instructions .



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2 Wiring Harness and Connector Repairs

⇒ “[2.1 Vehicle Electrical System, General Repair Information](#)”, page 67

⇒ “[2.2 Wiring Harness Repair Set](#)”, page 71

⇒ “[2.3 Tool Descriptions](#)”, page 74

⇒ “[2.4 Wiring Harnesses, Repairing](#)”, page 78

⇒ “[2.5 Fiber-Optic Cables, Repairing](#)”, page 89

⇒ “[2.6 Antenna Wires, Repairing](#)”, page 100

⇒ “[2.7 Connector Housings and Connectors, Repairing](#)”, page 113

⇒ “[2.8 Connector Housings, Releasing and Disassembling](#)”, page 115

2.1 Vehicle Electrical System, General Repair Information



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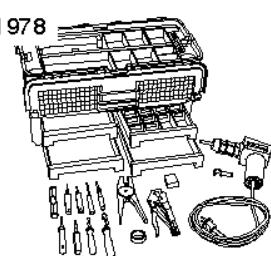
When disconnecting and connecting battery, the procedure must be followed as described in the Repair Manual.



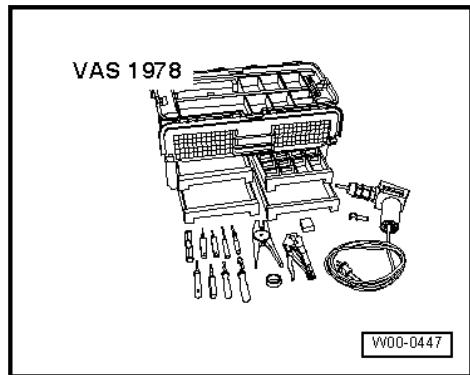
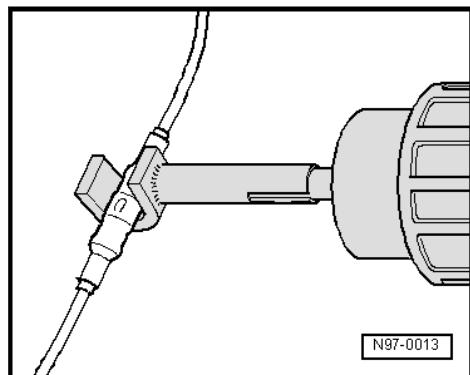
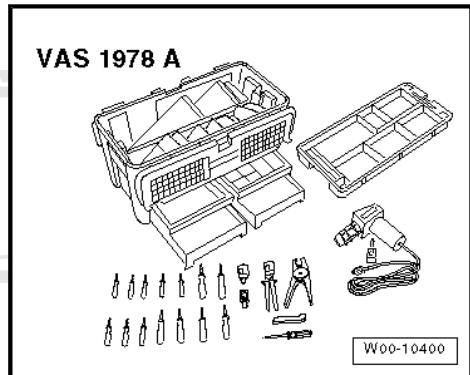
WARNING

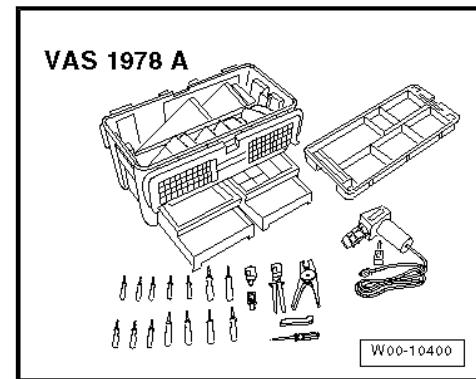
Some tools are supplied with a tool safety clip, which is slid over the tool points after using the tool, in order to protect other workers from injuries and tool points from damage.

VAS 1978



VW00-0447





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- ◆ Observe the current notes in the corresponding repair manual for all repairs.
- ◆ Observe country-specific regulations.
- ◆ Before working on the electrical system, the battery ground cable must be disconnected. By disconnecting the battery ground cable (current disruption), the electrical system is guaranteed to be safe to work on. The battery positive cable only needs to be disconnected to remove the battery.
- ◆ Before starting a repair, the cause of the damage must be eliminated first (for example sharp edges on chassis parts, faulty electrical consumers, corrosion etc.).
- ◆ For the wiring harnesses if possible a high quality replacement part is always delivered. This means that previously not required connector housings may be present on the replacement part.
- ◆ Additionally bend back the non-necessary connector housing if possible in the dry area of the vehicle and route them so that no noises can result.
- ◆ Additionally to prevent capillary action seal the non-necessary connector housing and single wires in wet areas of the vehicle with water tight heat-shrinkable tube. The necessary components to seal the single wires can be found in the ⇒ Electronic Parts Catalog (ETKA) .
- ◆ Further information, for example, installing and removing the individual components, can be found in the appropriate Repair Manual.
- ◆ Soldering is not permissible for repairs to the vehicle electrical system.
- ◆ Wiring harness and connector repairs on the vehicle electrical system may only be performed using the Wiring Harness Repair Set - VAS 1978 B- and previous versions such as the Wiring Harness Repair Set - VAS 631 001- and the Wiring Harness Repair Set - VAS 631 003- . Only use the yellow wires from the corresponding wiring harness-repair kit.
- ◆ Wiring harness repairs may not be performed again in the wrapping of the vehicle-specific wiring harness and are to be marked with yellow adhesive tape. This indicates a previous repair.
- ◆ Pinch and butt connectors **must not be repaired**. If necessary, lay a wire parallel to the faulty wire. After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration. Connectors with corresponding heat-shrinkable tube must be protected moisture penetration.
- ◆ Always observe the supplementary notes for repairing wiring harnesses on airbag- and seat belt tensioner systems, fiber optic cables, CAN bus lines, FlexRay wires, and antenna wires.
- ◆ A function test must be performed after every repair. If necessary, check DTC memory, erase and/or bring systems into basic setting.
- ◆ If possible, do not loosen grounding straps from the body (danger of corrosion).
- ◆ Not all wire cross-sections in the vehicle are contained in the Wiring Harness Repair Set - VAS 1978 B- and its previous versions. If the required wire cross-section is not present, the next greater cross-section must be used.
- ◆ Heat-resistant wires have been installed in the vehicle at various locations, mainly in the engine compartment. Heat-



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resistant wires can be recognized by their somewhat duller and softer insulation. Only heat-resistant wires may be used to repair these wires.

2.2 Wiring Harness Repair Set

- ⇒ [“2.2.1 Wiring Harness Repair Set VAS 1978 ”, page 71](#)
- ⇒ [“2.2.2 Upgrade Kit For VAS 1978 VAS 1978/50 ”, page 71](#)
- ⇒ [“2.2.3 Wiring Harness Repair Set VAS 1978A ”, page 72](#)
- ⇒ [“2.2.4 Release Tool Set VAS 1978/35 ”, page 72](#)
- ⇒ [“2.2.5 Wiring Harness Repair Set VAS 631 001 ”, page 72](#)
- ⇒ [“2.2.6 Wiring Harness Repair Set VAS 631 003 VAS 631 003 ”, page 73](#)

2.2.1 Wiring Harness Repair Set - VAS 1978-

The Wiring Harness Repair Set - VAS 1978- makes it possible to provide the optimal quality of repairs in the vehicle electrical system. Using the tools, repairs affecting harness connectors and for breaks in wiring can be performed. For this purpose, complete repair wires with terminals already crimped on are used and can be connected to vehicle-specific wiring harness by the use of crimp connections. A pair of crimping pliers with three different crimp slots and a hot air gun for shrinking the crimp connections provide trouble-free electrical connection.

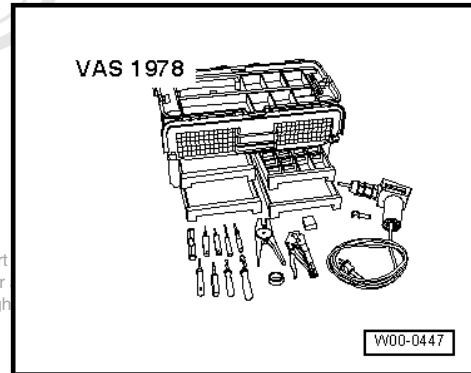


Note

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Additional information:

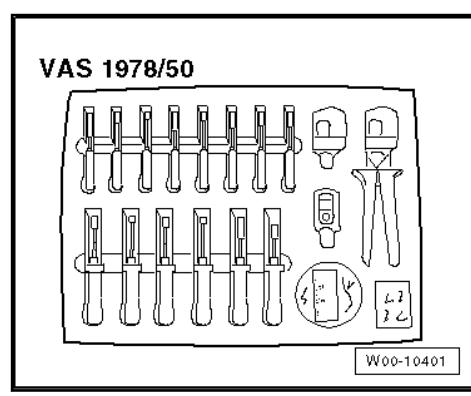
Refer to ⇒ [Wiring Harness Repair Set - VAS 1978B- Operating Instructions](#).



W00-0447

2.2.2 Upgrade Kit For VAS 1978 - VAS 1978/50-

The Upgrade Kit For VAS 1978 - VAS 1978/50- is required in order to bring the “old” Wiring Harness Repair Set - VAS 1978- up to the new standard of the Wiring Harness Repair Set - VAS 1978A-. The upgrade kit contains four assembly and ten release tools as well as new crimping pliers for crimp connections with Crimping Heads for 0.35 - 2.5 mm² Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1- , 4.0 - 6.0 mm² -VAS 1978/2 A- and the Wiring Harness Repair Set - Crimping Head - JPT - VAS 1978/9-1- . Furthermore it contains new stickers, a new set of user instructions, crimp connections for 0.35 mm²-wire cross sections and a roll of black felt adhesive tape.



W00-10401

2.2.3 Wiring Harness Repair Set - VAS 1978A-

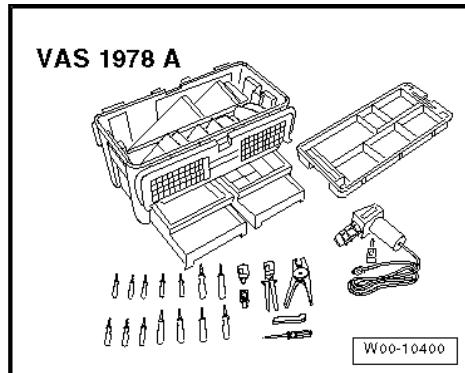
The new Wiring Harness Repair Set - VAS 1978A- makes it possible to provide the optimal quality of repairs in the vehicle electrical system. Using the new pliers, repairs affecting harness connectors and for breaks in wiring can be performed. For this purpose, complete repair wires with terminals already crimped on are used and can be connected to vehicle-specific wiring harness by the use of the four different types of crimp connections. A pair of new crimping pliers with crimping heads and a hot air gun for shrinking the crimp connections provide trouble-free electrical connection.



Note

Additional information:

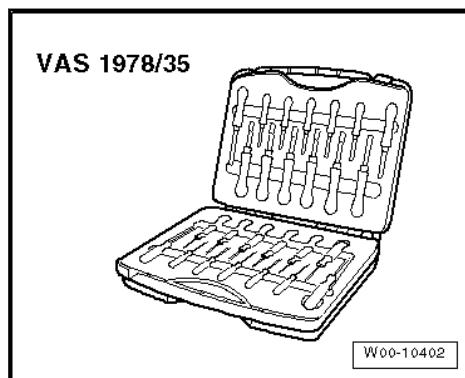
Refer to ⇒ Wiring Harness Repair Set - VAS 1978B- Operating Manual .



2.2.4 Release Tool Set - VAS 1978/35-

The Release Tool Set - VAS 1978/35- is used to release the various primary and secondary locking mechanisms on VW group vehicles. The set consists of 26 different tools which can be used to professionally release or assemble for example round connector systems, flat terminals with one or two locks as well as single wire seals.

The allocation of the correct release tools to the respective locking mechanisms can be found in the table in the ⇒ Release Tool Set - VAS 1978/35- Operating Instructions .



2.2.5 Wiring Harness Repair Set - VAS 631 001-

The Wiring Harness Repair Set - VAS 631 001- makes it possible to provide the optimal quality of repairs in the vehicle electrical system. Using this wiring harness repair set, repairs affecting aluminum wires close to the harness connectors and for breaks in wiring can be performed. For this, copper repair wires as well as complete copper repair wires with already crimped on contacts are used. The connection with the vehicle-specific wiring harness is done with three different butt connectors respective to the wire cross-sections.

The Wiring Harness Repair Set - VAS 631 001- for aluminum wires consists of the following components:

- ◆ Crimping tool without crimp insert and positioning aid -VAS 631 001/1- Protected by copyright. Copying for private or commercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- ◆ Crimping insert and positioning aid 2.5 mm²-aluminum wires -VAS 631 001/2-
- ◆ Crimping insert and positioning aid 4 mm²-aluminum wires -VAS 631 001/3-
- ◆ Crimping insert and positioning aid 6 mm²-aluminum wires -VAS 631 001/4-
- ◆ Wire stripper for aluminum wires -VAS 631 001/5-



Caution

For repairing the aluminum wires only use the corresponding butt connectors with heat-shrinkable tube. Refer to the ⇒ Electronic Parts Catalog (ETKA).



Note

Additional information:

Refer to the ⇒ Wiring Harness Repair Set - VAS 631 001- Owner's Manual .

2.2.6 **Wiring Harness Repair Set VAS 631 003 - VAS 631 003-**

The Wiring Harness Repair Set - VAS 631 003- makes it possible to provide the optimal quality of repairs in the vehicle electrical system. With this wiring harness-repair kit repairs can be performed on 10 mm² and 16 mm² wires in the area of the connections and on open circuits. The repair wires are also used an complete repair wires with already crimped on/connected contacts. The connection with the vehicle-specific wiring harness is done with two different butt connectors respective to the wire cross-sections.

The Wiring Harness Repair Set VAS 631 003 - VAS 631 003- for 10 mm² and 16 mm² wires consists of the following components.

- ◆ Case with Inlays -VAS 631 003/1-
- ◆ Hand Pliers -VAS 631 003/2-
- ◆ Insulation Removal Tool -VAS 631 003/3-
- ◆ Pair of Cable Cutters -VAS 631 003/4-
- ◆ Exchangeable head 10 mm² -VAS 631 003/5-
- ◆ Exchangeable head 16 mm² -VAS 631 003/6-



Note

Additional information:

Refer to the ⇒ Wiring Harness Repair Set VAS 631 003 - VAS 631 003- Owner's Manual .



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2.3 Tool Descriptions

- ⇒ [“2.3.1 Crimping Pliers with Insert”, page 74](#)
- ⇒ [“2.3.2 Contact Release Tools”, page 75](#)
- ⇒ [“2.3.3 Single Wire Seal Assembly Tools”, page 75](#)
- ⇒ [“2.3.4 Wiring Harness Repair Set - Wire Strippers VAS 1978/3 ”, page 75](#)
- ⇒ [“2.3.5 Wiring Harness Repair Set - Hot Air Blower VAS 1978/14A ”, page 76](#)
- ⇒ [“2.3.6 Crimping Pliers - .35-2.5mm VAS 1978/1A ”, page 77](#)

2.3.1 Crimping Pliers with Insert

The Wiring Harness Repair - Crimping Plier - Base Tool - VAS 1978/1-2- with the Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1- and the Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2 A- are components of the Wiring Harness Repair Set - VAS 1978 B-. Additionally there is also the Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3- . These exchangeable heads with the crimping pliers are inserted to crimp the crimp connector during a wiring harness repair.

Color of crimp connectors	Color of crimping slot	Wire cross-section	Exchangeable Head
transparent	None	0.13 mm ² /0.35 mm ² /0.5 mm ²	Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3-
transparent	Yellow	0.35 mm ² through 0.5 mm ²	Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1-
Red	Red	0.5 mm ² - 1.0 mm ²	Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1-
Blue	Blue	1.5 mm ² - 2.5 mm ²	Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1-
Yellow	Yellow	4.0 mm ² - 6.0 mm ²	Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2A-



◆ *Always be sure to use the correct crimping slot for the crimping connection used.*

◆ *Do not crimp wire insulation.*

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2.3.2 Contact Release Tools

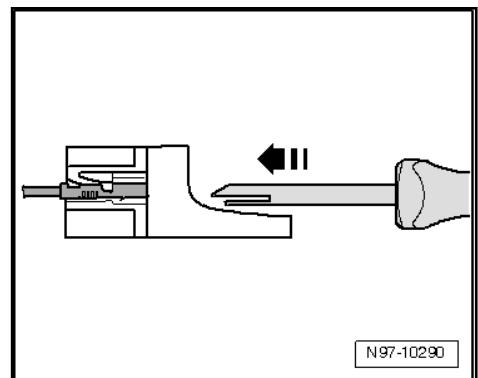
Various release tools are used to remove the different terminals from connector housing without damage.

A selection of release tools are a component of the Wiring Harness Repair Set - VAS 1978- and the Wiring Harness Repair Set - VAS 1978A-. The Release Tool Set - VAS 1978/35- contains the entire set of release tools. Refer to ["2.2.4 Release Tool Set VAS 1978/35", page 72](#).



WARNING

Some tools are supplied with a tool safety clip, which is slid over the tool points after using the tool, in order to protect other workers from injuries and tool points from damage.



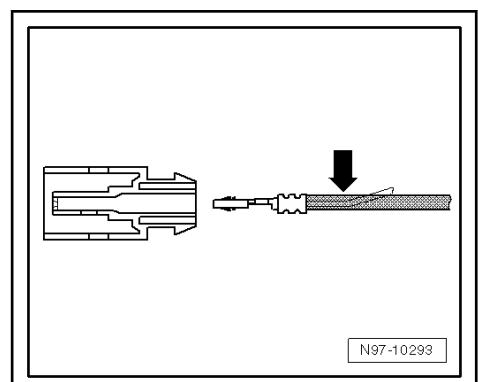
Connector Housings, Unlocking and Disassembling. Refer to ["2.8 Connector Housings, Releasing and Disassembling", page 115](#).

2.3.3 Single Wire Seal Assembly Tools

Assembly tools serve the purpose of allowing the single wire seals to be slid into the connector housing up to stop without damaging them, in order to achieve a complete seal between single wire and connector housing.

Four assembly tools for single wire seals are components of the Wiring Harness Repair Set - VAS 1978 B- and its previous versions.

Assembly of single wire seals. Refer to ["2.7.3 Single Wire Seals, Installing", page 114](#).



2.3.4 Wiring Harness Repair Set - Wire Strippers - VAS 1978/3-

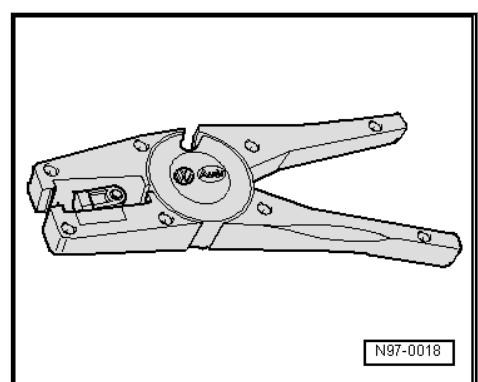
The Wiring Harness Repair Set - Wire Strippers - VAS 1978/3- is used for professional stripping and cutting of wires.

The Wiring Harness Repair Set - Wire Strippers - VAS 1978/3- is a component of the Wiring Harness Repair Set - VAS 1978 B- and its previous versions.

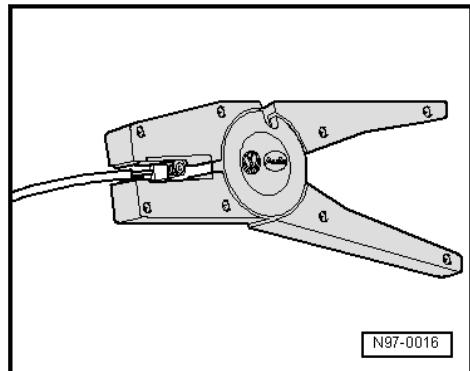
Wire stripper has an adjustable stop in its pliers-jaws which can be set to the desired length of wire insulation to be removed.

Stripping:

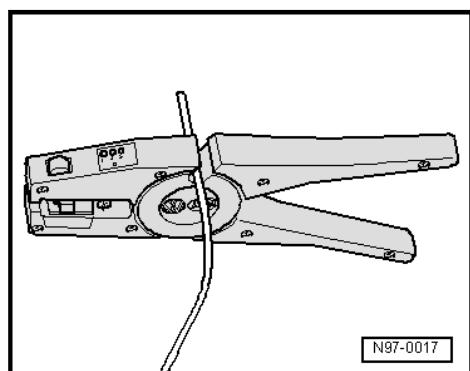
- Set the slideable stop in pliers-jaws to the desired length dimension to be stripped.



- Insert wire end from front up to stop into jaws of pliers and squeeze the pliers completely.
- Open pliers again and remove the stripped wire end.



- If necessary, cut wires using side-cutter function on the top of the wire stripper.



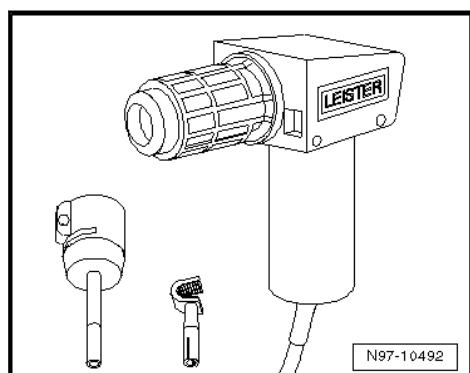
2.3.5 Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-



Caution

When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air gun.

Always observe operating instructions of heat gun.



The Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- is used together with the Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A- to heat-shrink the crimp connectors. After crimping, crimp connections must be heat-shrunk using hot air gun to prevent moisture penetration.

The Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- is a component of the Wiring Harness Repair Set - VAS 1978 B- and its previous versions.

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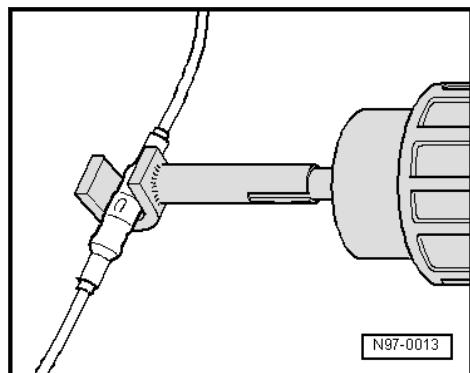
- Insert the **Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A-** on the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- .



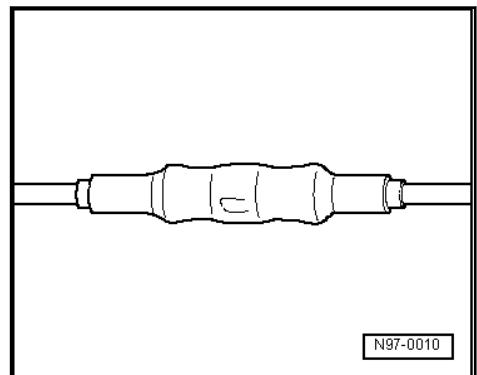
Caution

Risk of damaging surrounding components.

- ◆ *When heat-shrinking crimp connections, be careful not to damage any other wiring, plastic parts or insulating material with the hot nozzle of the hot air blower.*
- ◆ *Always observe operating instructions of heat gun.*



- Heat crimp connection using hot air gun lengthwise from center outward until it is sealed completely and adhesive comes out the ends.
- This is how the completed repair location with individual crimp connector should appear.



2.3.6 Crimping Pliers - .35-2.5mm - VAS 1978/1A-

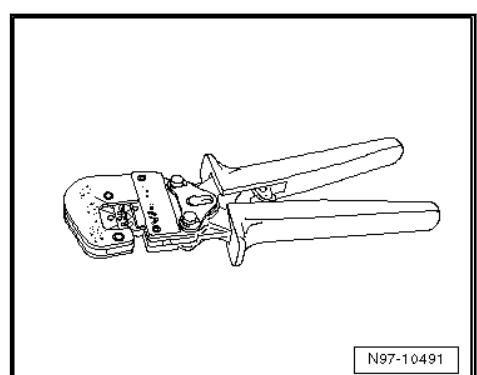
The Crimping Pliers - .35-2.5mm - VAS 1978/1A- or the Wiring Harness Repair - Crimping Plier - Base Tool - VAS 1978/1-2- together with the Wiring Harness Repair - Crimping Head

- .35-2.5mm - VAS 1978/1-1- , the Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3- , or the Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2A- are used to press the crimp connector from the wiring harness repair kit.

Crimp connectors, compress using the Crimping Pliers - .35-2.5mm - VAS 1978/1A- .

The following crimping heads are available for the Wiring Harness Repair - Crimping Plier - Base Tool - VAS 1978/1-2- :

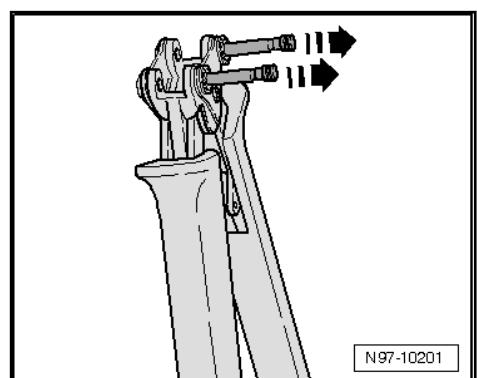
- ◆ Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3-
- ◆ Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1-
- ◆ Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2 A-
- ◆ Wiring Harness Repair Set - Crimping Head - JPT - VAS 1978/9-1-



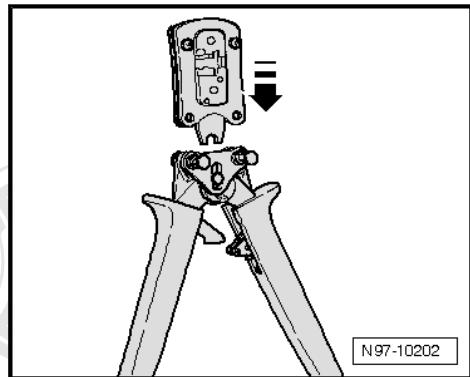
In conjunction with the Wiring Harness Repair Set - Crimping Head - JPT - VAS 1978/9-1- , crimping pliers are used to crimp terminals onto individual wires when repairing wiring cross-sections up to 0.35 mm².

Changing the crimping head:mercial purposes, in part or in whole, is not permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to documents which have been modified, adapted or translated by users.

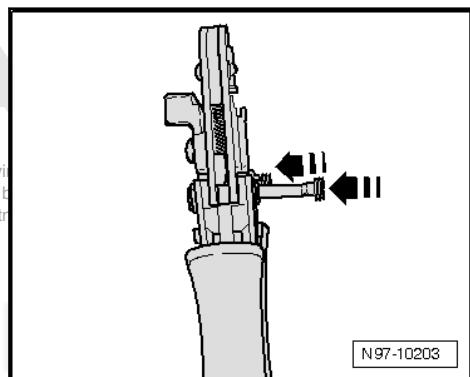
- Disengage both locking pins -arrows- from crimp pliers basic tool.



- Insert the required crimping head from above -arrow- in crimp pliers basic tool.



- Lock the crimping head by pressing in the pins -arrows- into crimp pliers basic tool.



2.4 Wiring Harnesses, Repairing

⇒ “2.4.1 Airbag and Belt Tensioner Wire Repair Information”, page 78

⇒ “2.4.2 CAN Bus Wires Repair Information”, page 79

⇒ “2.4.3 FlexRay Wire Repair Information”, page 80

⇒ “2.4.4 0.13 mm² - 6 mm² Wire, Repairing”, page 81

⇒ “2.4.5 10 mm² or 16 mm² Wire, Repairing”, page 83

⇒ “2.4.6 Aluminum Wire with Single Butt Connector 2.5 mm², 4 mm² or 6 mm², Repairing with Crimp Connector”, page 86

⇒ “2.4.7 Repair of Ethernet Lines”, page 89

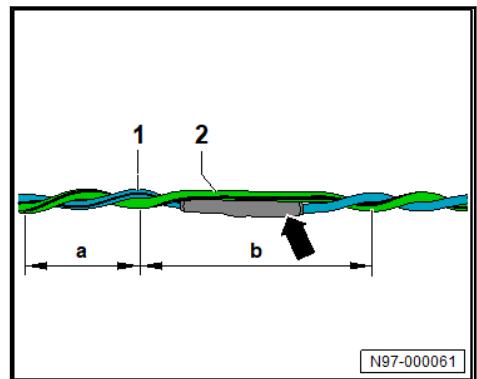
⇒ “2.4.8 Wire Section Repairs”, page 89

⇒ “2.4.9 Single Wire Seals, Installing”, page 89

2.4.1 Airbag and Belt Tensioner Wire Repair Information

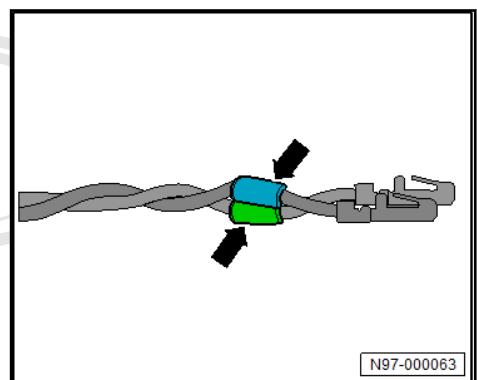
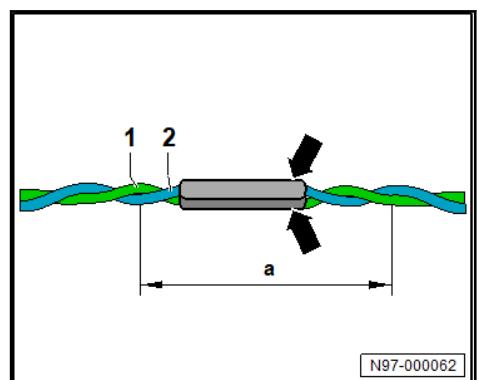
- ◆ For repairs maximum of 2 repairs areas can be performed.
- ◆ The crimp connectors must be shrunk.
- ◆ Do not wrap the repair area back in the wiring harness.
- ◆ Mark the repair location visible with yellow insulating tape.
- ◆ Perform the repair a maximum 30 cm from the connector housing.
- ◆ Lines to airbag and seat belt tensioner have a twisting with a routing length 20 mm ±5. The routing length must be maintained during the repair procedures.

- ◆ When repairing wires must be of the same length. When twisting together wires -1- and -2-, length of lay of -a-=20 mm ±5 must be strictly observed.
- ◆ There may be no section of wire -arrow- greater than -dimension b- = 100 mm without twisting the wiring.



2.4.2 CAN Bus Wires Repair Information

- ◆ Both CAN bus wires must be the same length.
- ◆ The repair of individual wire leads is not permitted.
- ◆ The repair of CAN bus wires must take place with the matching cross section. Refer to the ⇒ Electronic Parts Catalog (ETKA) for the allocation.
- ◆ No excess lengths may be created.
- ◆ There may be no section of wire -arrows- greater than -dimension a- = 100 mm without twisting the wiring.
- ◆ Wrap repair locations with yellow adhesive tape to mark a performed repair.
- ◆ The crimping of wires with connectors has to be performed in the same way.
- ◆ The repair locations -arrows- may lie on top of one another.
- ◆ The color coding for the CAN bus wires can be taken from the wiring diagram. Refer to ⇒ Wiring diagrams, Troubleshooting & Component locations.



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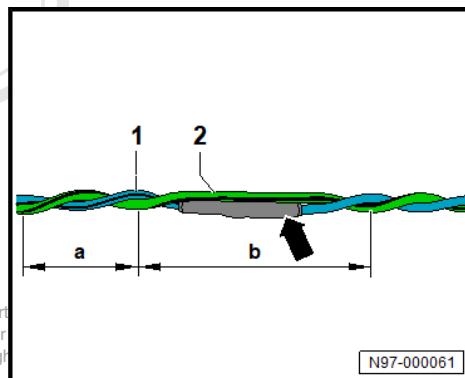


2.4.3 FlexRay Wire Repair Information

Two-layer wire or unshielded, twisted two-wire lines -1- and -2- with a cross section of 0.35 mm^2 can be used as FlexRay wires.

- ◆ The repair may only be performed using the specified wires from the ⇒ Electronic Parts Catalog (ETKA) .
- ◆ Both wires must be the exact same length.
- ◆ Mark the repair location with for example yellow insulating tape.
- ◆ For repairs on wires pay attention to the same specifications as on repair of a single wire.

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Wires with coating

When twisting together wires -1- and -2- the routing length of -a- = 30 mm must be observed.

While doing so, no section of wire may be greater than -b- = 50 mm without twisting the wires -arrow-.

Conditions

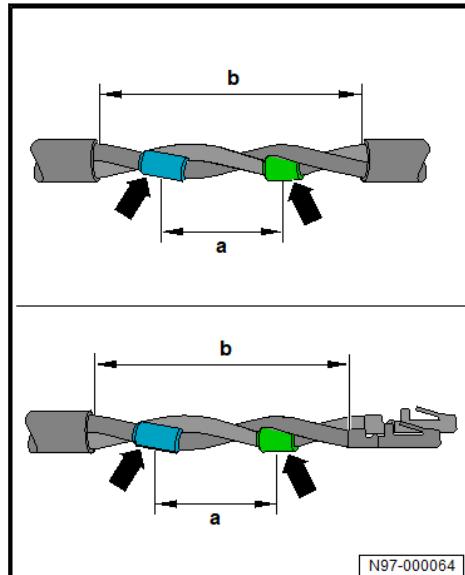
- Maximum exposed wire length: -b- = 100 mm.
- Protect the repair area with heat-shrinkable tube. Wrap the exposed wire with water tight insulating tape.
- Position both repaired locations -arrows- -a- = 30 mm opposite each other.
- Crimping the wires with connectors must take place in the same way.

Wires without coating

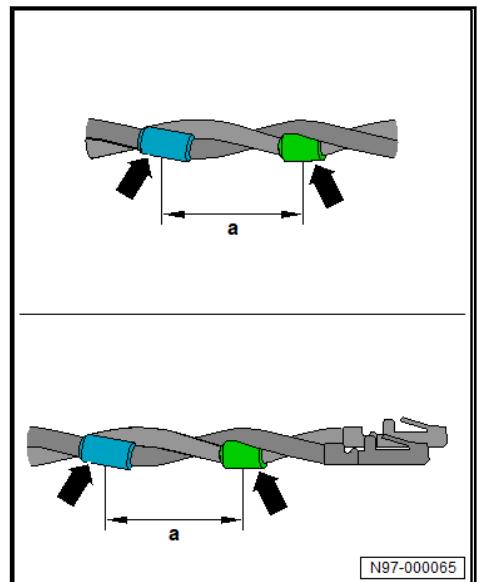
When twisting together wires -1- and -2- the routing length of -a- = 20 mm must be observed.

While doing so, no section of wire may be greater than -b- = 40 mm without twisting the wires -arrow-.

Conditions



- Position both repaired locations at a routing length of -A- = 20 mm opposite each other.
- Crimping the wires with the connectors must take place in the same way.



2.4.4 0.13 mm² - 6 mm² Wire, Repairing

Special tools and workshop equipment required

- ◆ Wiring Harness Repair - Crimping Plier - Base Tool - VAS 1978/1-2-
- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-
- ◆ Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A-
- ◆ Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3-
- ◆ Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1-
- ◆ Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2A-

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- Install the Wiring Harness Repair - Interchangeable Head - VAS 1978/1-3- or Wiring Harness Repair - Crimping Head - .35-2.5mm - VAS 1978/1-1- or Wiring Harness Repair Set - Crimping Head - 4-6mm - VAS 1978/2A- on the Wiring Harness Repair - Crimping Plier - Base Tool - VAS 1978/1-2- depending on the wire cross-section.
- Cut off the damaged part of the wiring harness.

Conditions

- If both ends are too short to repair with a crimp connector after cutting out the damaged section of the wiring harness, a yellow repair wire with two crimp connectors must be used.

- Insert the wire end -2- all the way -arrow- in the cross section fitting mount on the interchangeable head -1-.
- Press together the crimping pliers and hold.
- Remove the wiring eyelet -2- to the wire stripper out of the interchangeable head -1-.
- Open the crimping pliers.

Conditions

- The insulation must be cut cleanly and removed from the wires.
- The single wires must not be damaged.
- Repeat the process of stripping off the end of the wire -2- on the other wire.

0.13 mm² wires

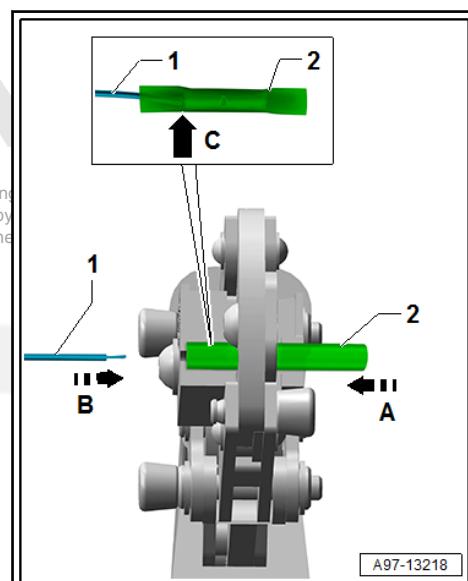
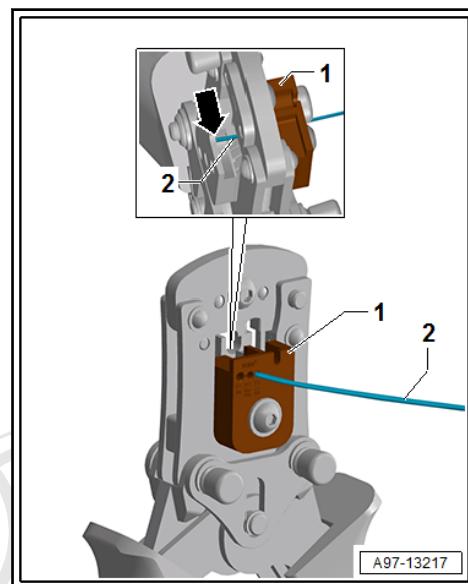
- Slide the heat-shrinkable tube onto the wire, refer to the
⇒ Electronic Parts Catalog (ETKA) .

Continuation for all vehicles

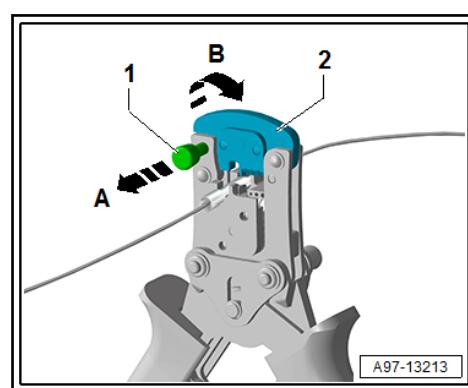
- Push the crimp connector -2- in the -direction of arrow A- all the way into the crimping opening.
- Push the stripped wire -1- in the -direction of arrow B- into the crimp connector -2-.

Conditions

- All single wires must be pushed in the crimp connector -2- in the direction of arrow A-.
- Do not crimp the wire insulation -arrow C-.
- Push the crimping pliers together and then open.
- Remove the wire -1- with the crimp connector -2-.
- Crimp the wire -1- with the crimp connector -2- on the other side as described.

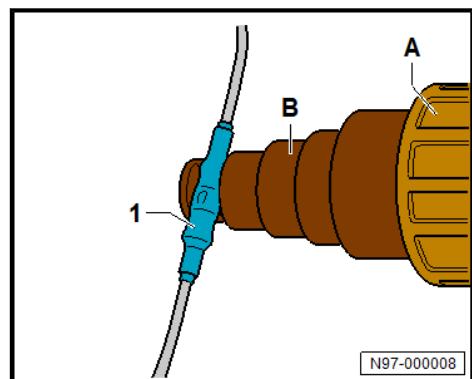


- Remove the locking pin -1- all the way in the -direction of the arrow A-.
- Pivot the upper section on the interchangeable head -2- in the -direction of the arrow B-.
- Remove the crimped crimp connector.



- Shrink the crimp connector -1- using the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- -A- and the Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A- -B-.

0.13 mm² wires



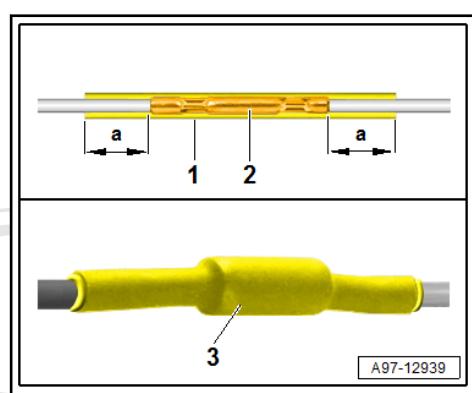
- Slide the heat-shrinkable tube -1- until it is centered over the crimp connector -2-.

Conditions

- The dimension -A- must be the same on both sides.
- Shrink the heat-shrinkable tube -1- from the inside toward the outside using a hot air gun and shrink element.
- Check the completed repair area -3-.

Conditions

- The heat-shrinkable tube -1- must be fully shrunk.
- Adhesive must escape at the ends.

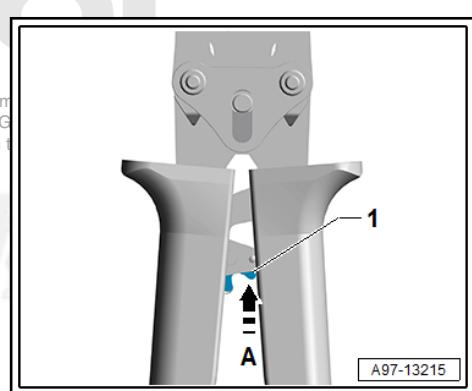


Continuation for all vehicles

Early release

- Release the release lever -1- in the -direction of arrow A-.
- At the same time push the crimping pliers together and then open.

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2.4.5 10 mm² or 16 mm² Wire, Repairing

Special tools and workshop equipment required

- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-
- ◆ Wiring Harness Repair Set VAS 631 003 - VAS 631 003-
- ◆ Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A-

Removing

- Install a crimp insert and a crimp stamp for the wire cross-section on the crimping pliers from the Wiring Harness Repair Set - Copper - VAS 631 003- .
- Cut off the damaged part of the wiring harness.

Conditions

- If both ends are too short to repair with a crimp connector after cutting out the damaged section of the wiring harness, a yellow repair wire with two crimp connectors must be used.
- Strip the wires depending on their cross section to the determined length to be stripped.

- ◆ 10 mm² wires: 14 mm
- ◆ 16 mm² wires: 16.5 mm

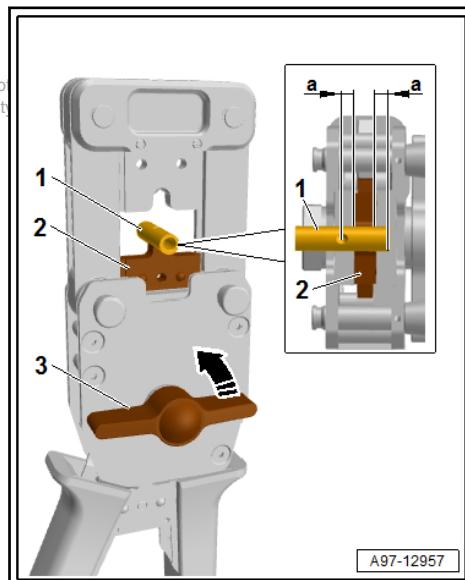
Conditions

- The insulation must be cut cleanly and removed from the wires.
- The single wires must not be damaged.
- Slide the heat-shrinkable tube onto one of the wires, refer to the ⇒ Electronic Parts Catalog (ETKA).
- Position the crimp connector -1- with the first crimping position centered on the crimp insert -2-.

Conditions

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- Dimension -a- must be the same.
- Turn the quick feed lever -3- in the -direction of the arrow- until the crimp connector -1- is secured.



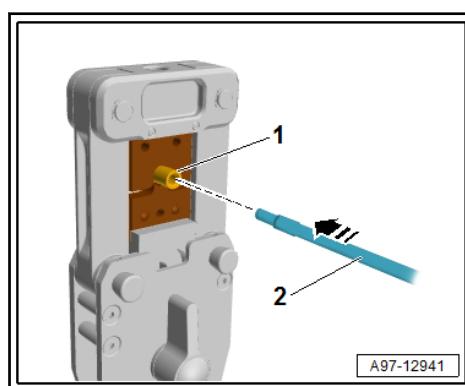
- Slide in the wire -2- with the stripped end in the -direction of the arrow- all the way into the crimp connector -1-.

Conditions

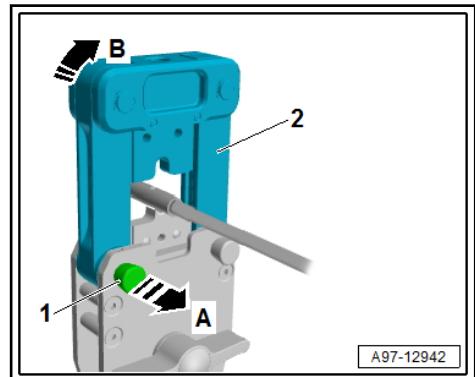
- All single wires must be pushed into the crimp connector.
- Completely close and open the crimping pliers several times until the crimp insert goes downward by itself into its original position.

Conditions

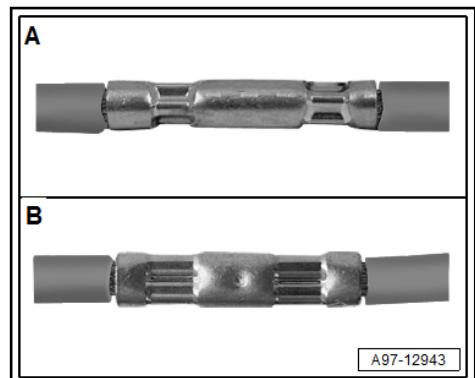
- Do not crimp the wire insulation -2-.
- Repeat the wire crimping with the crimp connector -1- on the other side.



- Remove the securing pin -1- in the -direction of the arrow A- until it stops.
- Open the adapter -2- in the -direction of the arrow B-.
- Remove the crimped crimp connector.



- Check the crimped crimp connector.
 - ◆ -A- - 10 mm², star crimp
 - ◆ -B- - 16 mm², B crimp



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- Slide the heat-shrinkable tube -1- centrally over the crimp connector -2-.

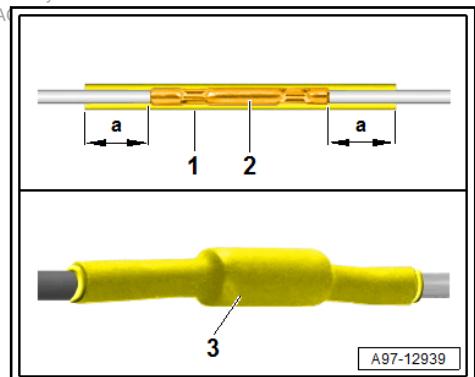
Conditions

- The dimension -a- must be the same on both sides.
- Shrink the heat-shrinkable tube -1- using the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- and the Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A- starting from the inside and going outward.
- Check the completed repair area -3-.

Conditions

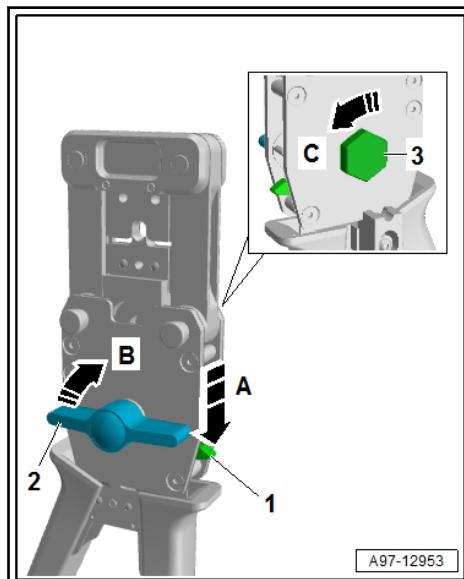
- The heat-shrinkable tube must be fully shrunk.
- Adhesive must escape at the ends.

Early release

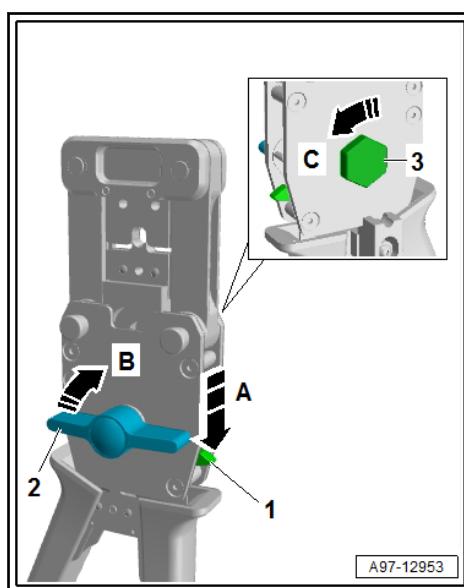


- Release the release lever -1- in the -direction of arrow A-.
- Turn the quick feed lever -2- in the -direction of the arrow B- until the crimp insert is in its original position.

If an early release by hand is not possible, then:



- Release the release lever -1- in the -direction of arrow A-.
- Turn the bolt -3- in -direction of the arrow C- until the crimp insert is in its original position.



2.4.6 Aluminum Wire with Single Butt Connector 2.5 mm², 4 mm² or 6 mm², Repairing with Crimp Connector

Special tools and workshop equipment required

- ◆ Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A-
- ◆ Wiring Harness Repair Set - VAS 631 001-
- ◆ Wiring Harness Repair Set VAS 631 003 - VAS 631 003-
- ◆ Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A-

Tip

Repairs are done using copper wires. Refer to Electronic Parts Catalog (ETKA). This document, in whole, is not authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.

Removing

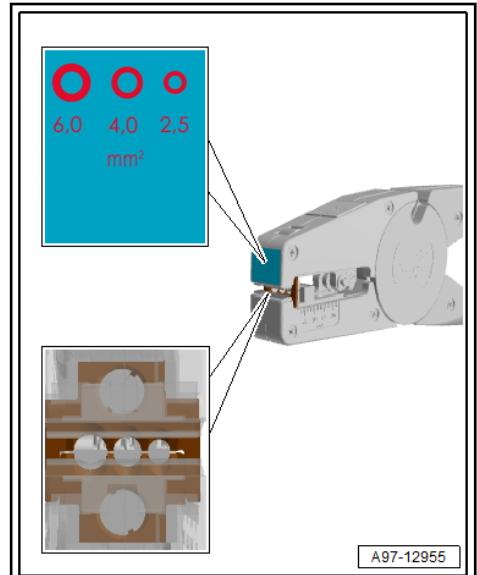
- Install a crimp insert, crimp stamp and contact positioner with contact cross bar for the wire cross-section on the

crimping pliers from the Wiring Harness Repair Set - Copper
- VAS 631 003- .

- Cut off the damaged part of the wiring harness.
- Insert the end of the wire from the front all the way into the suitable section on the wire stripper from the Wiring Harness Repair Set - Aluminum - VAS 631 001- .
- Push the wire stripper together and then open.
- Remove the stripped wire.

Conditions

- The insulation must be cut cleanly and removed from the wires.
- The single wires must not be damaged.
- Repeat the stripping of the wire end on the other wire as described.
- Slide the heat-shrinkable tube onto the wire, refer to the
⇒ Electronic Parts Catalog (ETKA) .



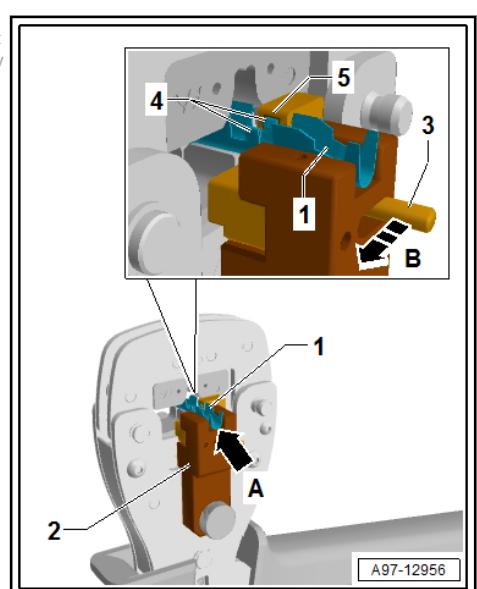
- Place the crimp connector -1- in the contact positioner -2-.

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- The crimp connector -1- must end flush -arrow A- with the contact positioner -2-.
- Move the contact cross bar -3- all the way in
-direction of arrow B-, until the crimp connector -1- is secured.

Conditions

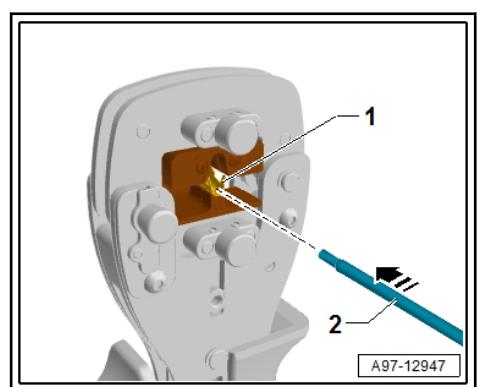
- The tabs -4- on the crimp connector -1- must engage in the groove -5- on the contact cross bar -3-.



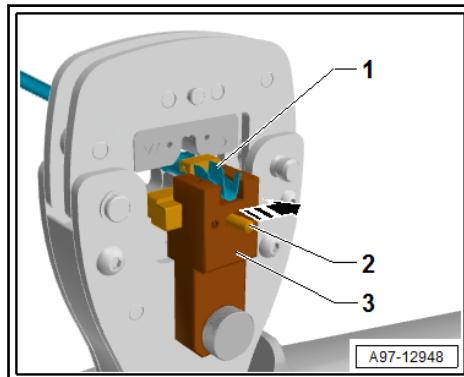
- Slide the wire -2- with the stripped end in the
-direction of the arrow- all the way into the crimp connector
-1-.

Conditions

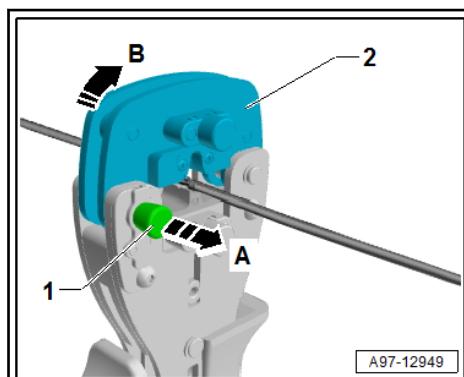
- All single wires must be pushed into the crimp connector -1-.
- The insulation end of the wire -2- can at a maximum be flush with the front edge of the insulation crimps.
- Close the crimping pliers completely until they reopen automatically.



- Push the contact cross bar -2- all the way in the -direction of the arrow-.
- Remove the crimp connector -1- from the contact positioner -3-.
- Turn the crimping pliers.
- Repeat the crimping of the wire -1- with the crimp connector -2- on the other side as shown.



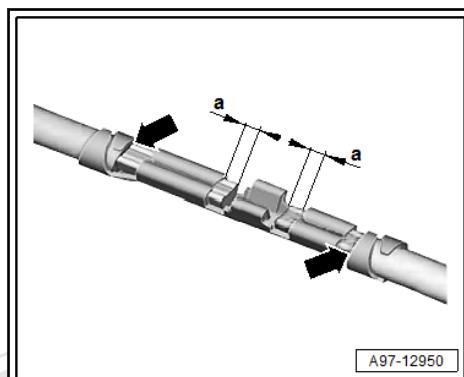
- Remove the securing pin -1- in the -direction of the arrow A- until it stops.
- Open the adapter -2- in the -direction of the arrow B-.
- Remove the crimped crimp connector.



- Check the crimped crimp connector.

Conditions

- Dimension -A- = 0.1 to 1.0 mm
- The insulation end -arrow- can at a maximum be flush with the front edge of the insulation crimps.



- Slide the heat-shrinkable tube -1- until it is centered over the crimp connector -2-.

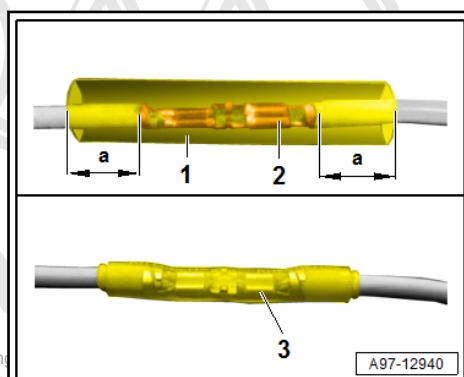
Conditions

- The dimension -A- must be the same on both sides.
- Shrink the heat-shrinkable tube -1- using the Wiring Harness Repair Set - Hot Air Blower - VAS 1978/14A- and the Wiring Harness Repair - Blower - Shrink Element - VAS 1978/15A- starting from the inside and going outward.
- Check the completed repair area -3-.

Conditions

- The heat-shrinkable tube -1- must be fully shrunk with respect to the correctness of information in this document. Copyright by AUDI AG.
- Adhesive must escape at the ends.

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2.4.7 Repair of Ethernet Lines

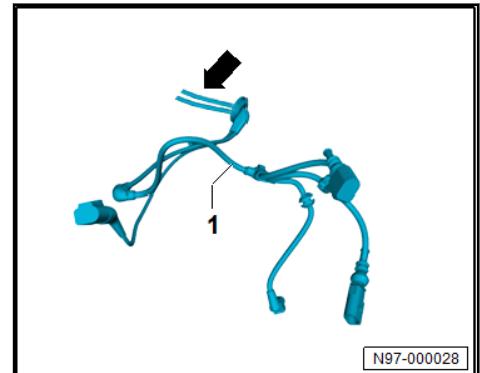
Removing

Damaged Ethernet lines must be replaced, because the lines cannot be repaired.

2.4.8 Wire Section Repairs

Removing

- Cut through the damaged wire at the designated area -arrow- for the old wire -1-.
- Connect the new wire -1- at the designated area -arrow-.



2.4.9 Single Wire Seals, Installing

Special tools and workshop equipment required

- ◆ Wiring Harness Repair Set - VAS 1978B-
- Assembly of single wire seals is described in the ⇒ Operating Instructions for the Wiring Harness Repair Set - VAS 1978B- .

2.5 Fiber-Optic Cables, Repairing

⇒ "2.5.1 Fault Location, Determining", page 89

⇒ "2.5.2 Fiber-Optic Cable, Preparing with the Fiber-Optic Conductor Repair Set VAS 6223 ", page 90

⇒ "2.5.3 Fiber-Optic Cable, Preparing with Fiber-Optic Conductor Repair Set VAS 6223A ", page 94

⇒ "2.5.4 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector", page 99



Caution

Do not bend the fiber-optic cable too much. Do not exceed a bending radius of 25 mm.

Fiber optic cables must not be routed over sharp edges.

Fiber-optic cable ends must not be soiled or touched with bare fingers.

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Fiber optic cables may not be heated.

It is not permitted to twist together two fiber optic cables or one fiber optic cable with a copper wire.

Protect the connector and connection box from dust. Use the protective cap from the case.

2.5.1 Fault Location, Determining

Special tools and workshop equipment required

◆ Vehicle Diagnostic Tester

Procedure

It is difficult to determine an exact fault location. The damaged fiber-optic cable is to be replaced, by a new line routed parallel to the damaged fiber-optic cable.

 Note

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- ◆ Via the "Guided Fault Finding" it can be determined which component of the fiber-optic cable is damaged.

- ◆ An already repaired fiber-optic cable can be identified by being "yellow".

- Perform in the "Off-board Diagnostic Information System Service" the "Ring break diagnosis" function in the ⇒ Vehicle diagnostic tester.
- Remove the corresponding component.
- Remove the connector from the components.
- Assemble the fiber-optic cable:
 - ◆ Refer to [⇒ "2.5.2 Fiber-Optic Cable, Preparing with the Fiber-Optic Conductor Repair Set VAS 6223 "](#), page 90
 - ◆ Refer to [⇒ "2.5.3 Fiber-Optic Cable, Preparing with Fiber-Optic Conductor Repair Set VAS 6223A "](#), page 94

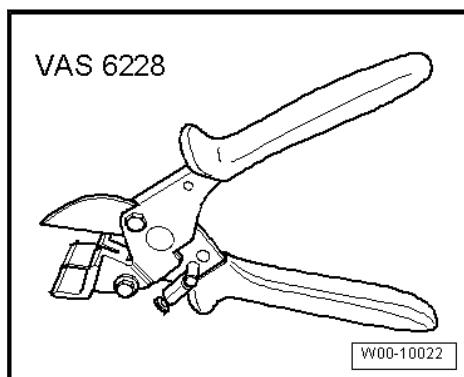
2.5.2 Fiber-Optic Cable, Preparing with the Fiber-Optic Conductor Repair Set - VAS 6223-

Special tools and workshop equipment required

- ◆ Fiber-Optic Repair Set - VAS 6223-

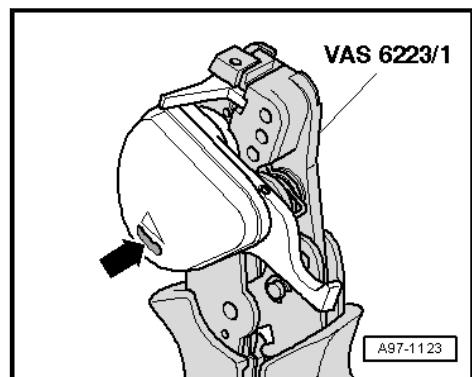


- ◆ Hose Cutting Pliers - VAS 6228A-



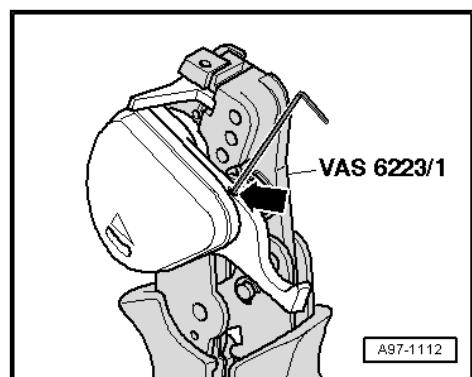
Checking remaining cut indicator

- Start by checking remaining cut indicator:
 - ◆ The Fiber-Optic Repair Set - Pliers - VAS 6223/1- cutting device can perform approximately 1,260 cuts. The blade is rotated for each further cut.
 - ◆ The remaining cut indicator -arrow- displays the last 150 cuts available.
 - ◆ Once no further cuts are available, the blade is blocked. Then it must be replaced. Refer to the ⇒ Operating Instructions that come with Fiber-Optic Repair Set - Pliers - VAS 6223/1- .



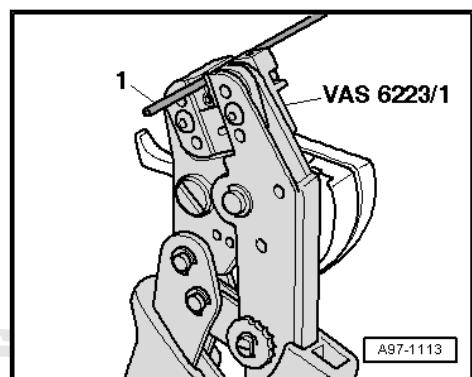
Fiber-Optic Repair Set - Pliers - VAS 6223/1- , Preparing

- Release the transportation safeguard on the cutter by loosening the bolt -arrow-.



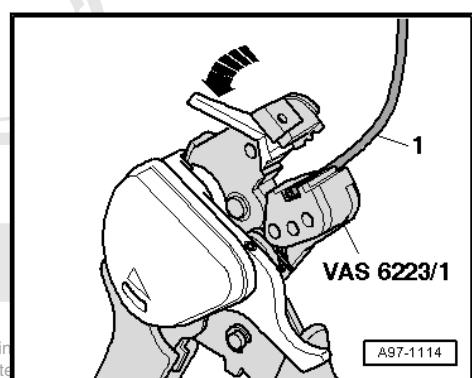
Fiber optic cable, cutting to length

- Establish the length of fiber optic cable required.
- Open the Fiber-Optic Repair Set - Pliers - VAS 6223/1- and insert the fiber-optic cable -1- into trimming station.
- Close cutting tool to cut fiber optic cable to length.



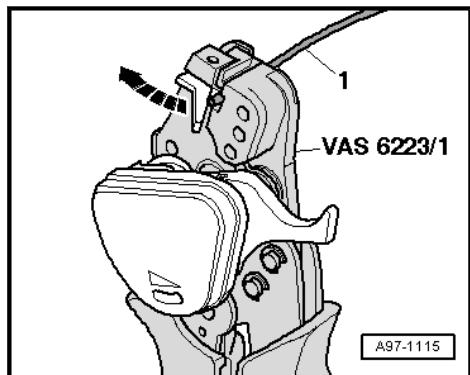
Stripping

- Open the Fiber-Optic Repair Set - Pliers - VAS 6223/1- .
 - The wire stripper must be in the lower position -arrow-.
 - Place the fiber optic cable -1- in the stripping station.
 - The end of the fiber-optic cable must be flush with the rear side of the cutting pliers.



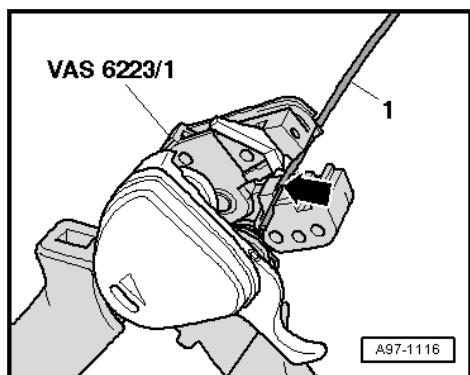
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- Close the Fiber-Optic Repair Set - Pliers - VAS 6223/1- all the way and keep them closed.
- Lift the wire stripping lever upward -arrow-.
- Open the cutting tool and take out the fiber-optic cable -1-.
- Detach the separated section of the insulation from the fiber-optic cable.



Precision cutting (production of optical end face)

- Slide the fiber-optic cable -1- into the cutting station.
- Insulation must make contact at stop -arrow- of cutting station.
- Close the Fiber-Optic Repair Set - Pliers - VAS 6223/1- .

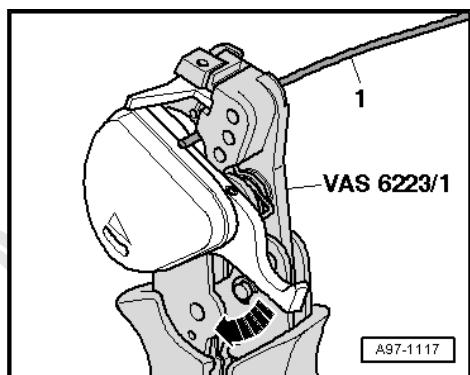


- Press the cutting unit downward -arrow-.
- Open Fiber-Optic Repair Set - Pliers - VAS 6223/1- and remove the fiber-optic cable -1-.



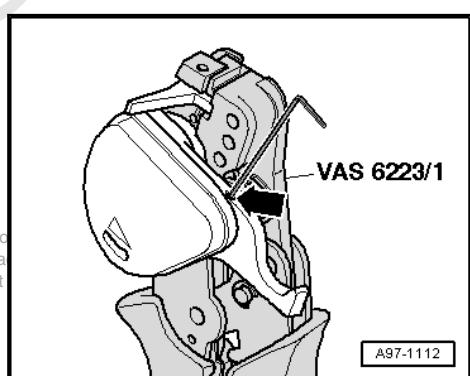
Note

The fiber-optic cable should only be placed on a completely clean surface.



Transport Protection, Activating

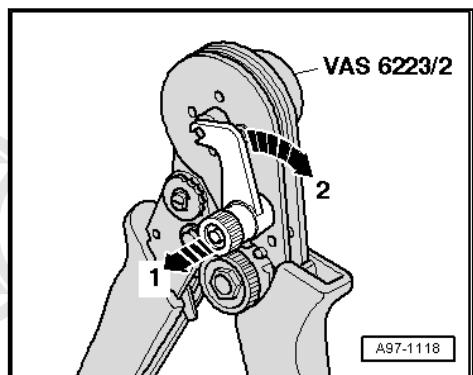
- Close the Fiber-Optic Repair Set - Pliers - VAS 6223/1- .
- Tighten the hex socket bolt -arrow- for the transportation safeguard on the cutter.



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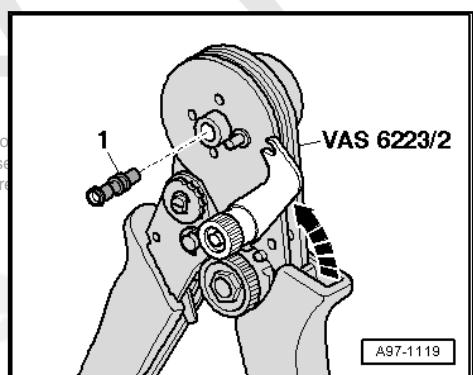
Attaching brass pin contact to fiber optic cable

- Open the securing lever on Fiber-Optic Repair Set - Crimping Pliers - VAS 6223/2- -arrow 1- and -arrow 2-.



- Insert a brass pin contact -1- in the mount.
- Close the safety lever on the Fiber-Optic Repair Set - Crimping Pliers - VAS 6223/2- -arrow-.

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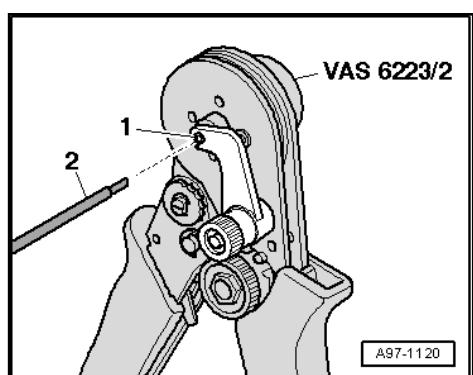


- Slide the fiber optic cable -2- into the brass pin contact -1- as far as spring-loaded stop.
- Slide the fiber-optic cable farther in up to the fixed stop and close the Fiber-Optic Repair Set - Crimping Pliers - VAS 6223/2- .
- Open the crimping pliers for fiber-optic cable and remove the fiber-optic cable with the brass pin contact.



Caution

Do not bend the fiber-optic cable too much. Do not exceed a bending radius of 25 mm.

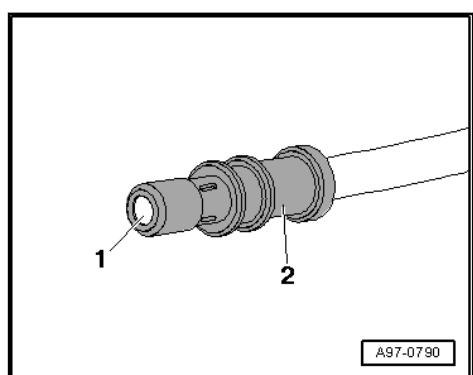


- Make sure the brass pin contact -2- is secured correctly on the fiber-optic cable -1-.
- Four crimp points must be visible at the brass connection pin.
- The brass pin contact must not be able to be removed by hand from the fiber-optic cable.
- The front surface of the fiber-optic cable is 0.01 to 0.1 mm behind the brass pin contact (visual check).



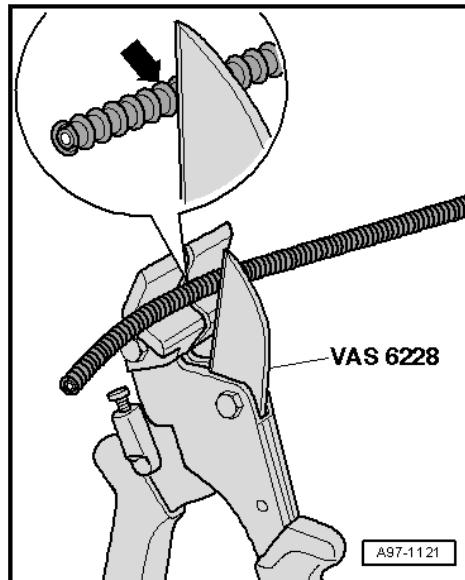
Note

- ♦ Connector couplings are available for connecting the fiber-optic cables. Refer to ⇒ *Electronic Parts Catalog (ETKA)*.
- ♦ Installing a new fiber optic cable in the wiring harness connector. Refer to ⇒ *"2.5.4 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector", page 99*.

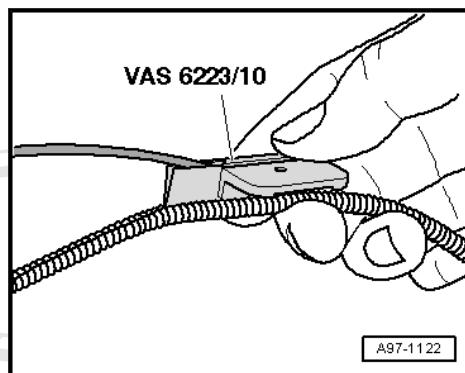


Corrugated Tube, Installing on Fiber-Optic Cable

- Cut the corrugated tube to the appropriate length.
- Use the Hose Cutting Pliers - VAS 6228- or a sharp knife for cutting.
- The corrugated tube must not be cut through using a side cutter under any circumstances
- The corrugated tube must be cut on the wave peak -arrow-, not in the wave trough.



- Guide the fiber-optic cable into Fiber-Optic Repair Set - Tube Tool - VAS 6223/10- as shown.
- Position the crimping pliers for fiber-optic cable at the slot on the corrugated tube.
- Slide the crimping pliers for fiber-optic cable along the slot on the circumference of the corrugated tube. The fiber optic cable is then routed in the corrugated tube.

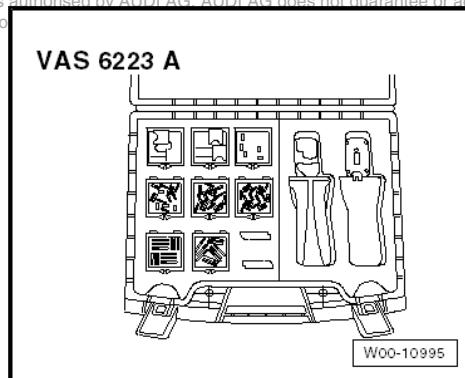


2.5.3 Fiber-Optic Cable, Preparing with Fiber-Optic Conductor Repair Set - VAS 6223A-

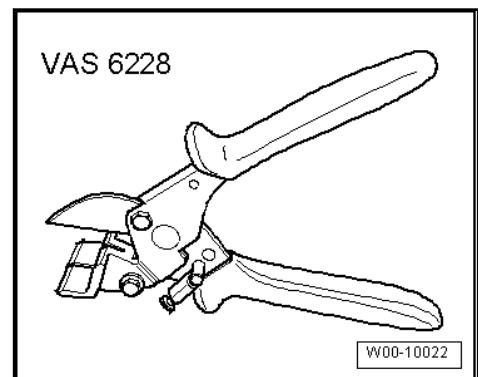
Special tools and workshop equipment required

- ◆ Fiber-Optic Conductor Repair Set - VAS 6223A-

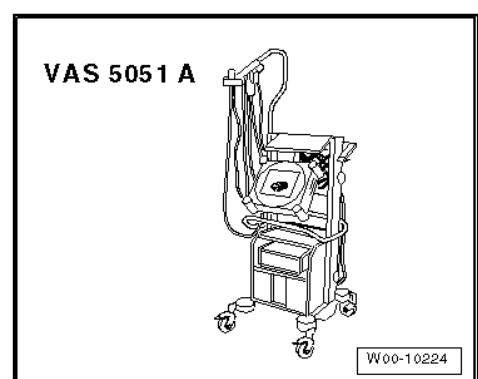
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- ◆ Hose Cutting Pliers - VAS 6228A-



- ◆ Vehicle Diagnostic Tester



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Do not bend the fiber-optic cable too much. Do not exceed a bending radius of 25 mm.

Fiber optic cables must not be routed over sharp edges.

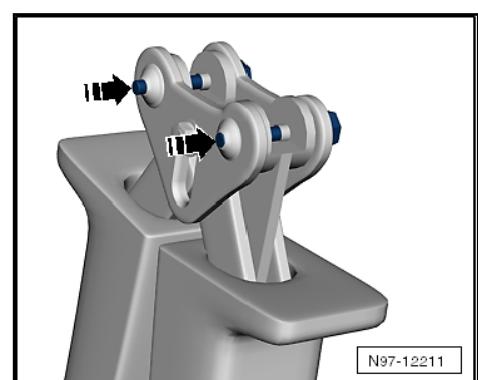
Fiber-optic cable ends must not be soiled or grasped with bare fingers.

Fiber optic cables may not be heated.

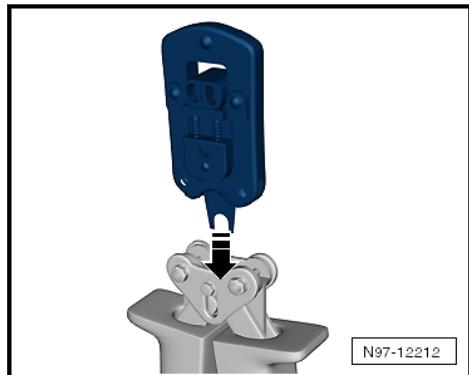
It is not permitted to twist together two fiber optic cables or one fiber optic cable with a copper wire.

Protect the connector and connection box from dust. Use the protective cap from the case.

Mount the tool head for the Fiber-Optic Repair Set - Pliers -
VAS 6223/1- .

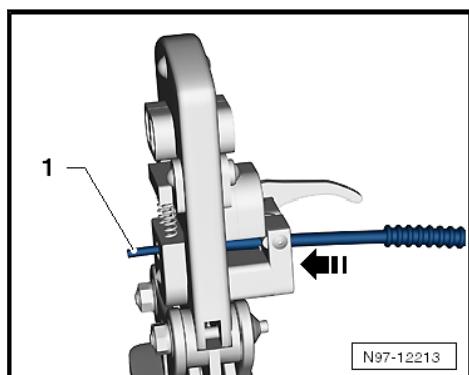


- Pry out the securing pins -arrows-.
- Position the tool head -arrow- and push back the locking pin.



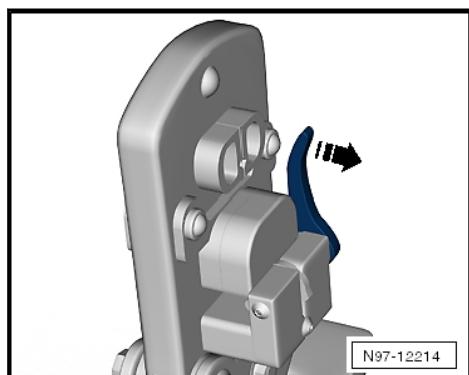
Fiber optic cable, cutting to length.

- Create the necessary length of the fiber-optic cable.
- Open the Fiber-Optic Repair Set - Pliers and lay the fiber-optic cable -1- in the mount.
- Close the Fiber-Optic Repair Set - Pliers to cut the fiber-optic cable lengths.

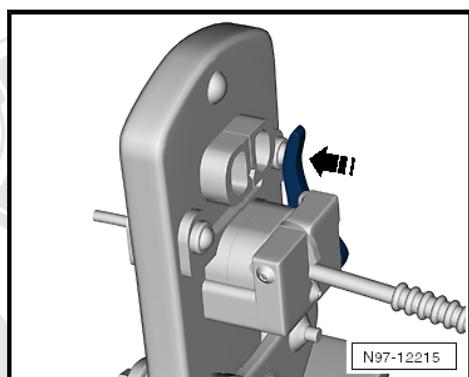


Stripping

- Open the Fiber-Optic Repair Set - Pliers - VAS 6223/1- .
- Position the wire stripper in the lower position -arrow-.
- Position the fiber-optic cable in the stripper mount.
- The end of the fiber-optic cable must be flush with the rear side of the cutting pliers.



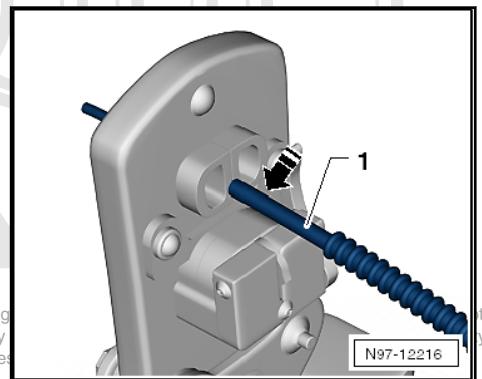
- Close the Fiber-Optic Repair Set - Pliers until the stop and keep closed.
- Bend the wire stripper upward -arrow- and remove the fiber-optic cable.



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Precision cutting (production of optical end face).

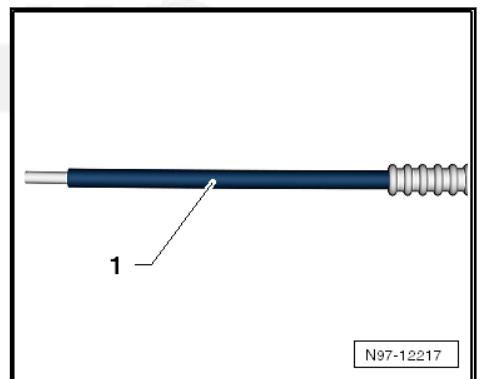
- Push the fiber-optic cable -1- in the cutting edge mount.
- The insulation must make contact with the cutting point stop.



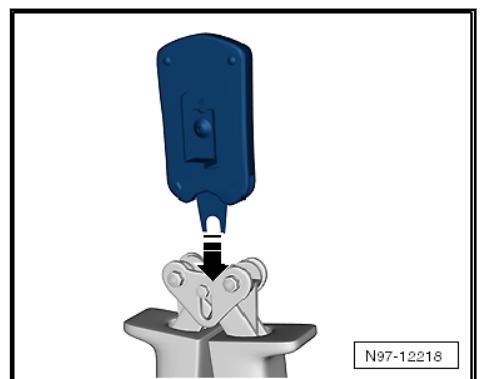
- Close the Fiber-Optic Repair Set - Pliers - VAS 6223/1- and remove the wire.
- Visually inspect the wire -1- to make sure that it was cut correctly and that there are no burrs on the front surface.

Note

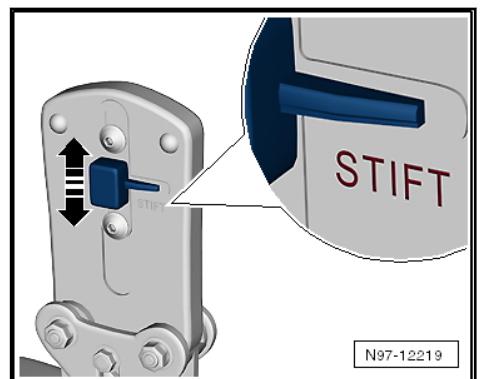
- ◆ Place the fiber-optic cable only on a completely clean surface/backing plate or hold in a hand.
- ◆ Use the protective cap, if there is a risk of contamination of the fiber-optic cable front surface.



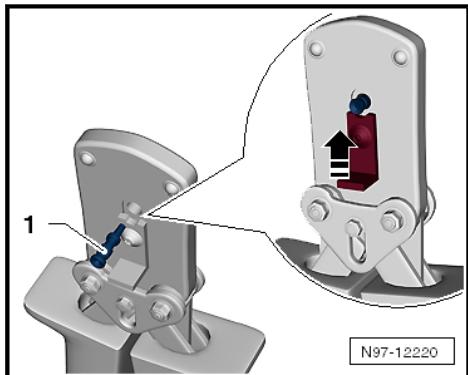
Attaching brass pin contact to fiber-optic cable.



- Change the tool head -arrow-.
- Slide the safeguard on the Fiber-Optic Repair Set - Pliers -arrow- so that the word “Stift” (pin) is legible.



- Place a brass contact pin -1- in the mount.
- Close the securing lever on the Fiber-Optic Repair Set - Pliers -arrow-.

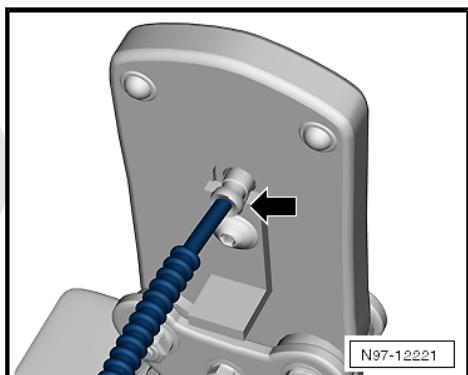


- Insert the fiber-optic cable into the brass pin contact -arrow- all the way up to the threaded stop and then close the Fiber-Optic Repair Set - Pliers .
- Open the pliers for the fiber-optic cable and remove the fiber-optic cable with brass contact pin.



Caution

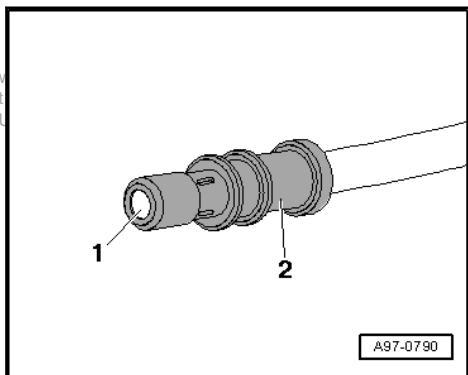
Do not excessively bend or kink the fiber-optic cables (minimum bending radius 25 mm).



- Make sure the brass pin contact -2- is secured properly on the fiber-optic cable -1-.
- On the brass pin the four crimping position must be visible.
- The brass pin contact must not be able to be removed by hand from the fiber-optic cable.
- The front surface of the fiber-optic cable is 0.01 to 0.1 mm behind the brass pin contact (visual check).

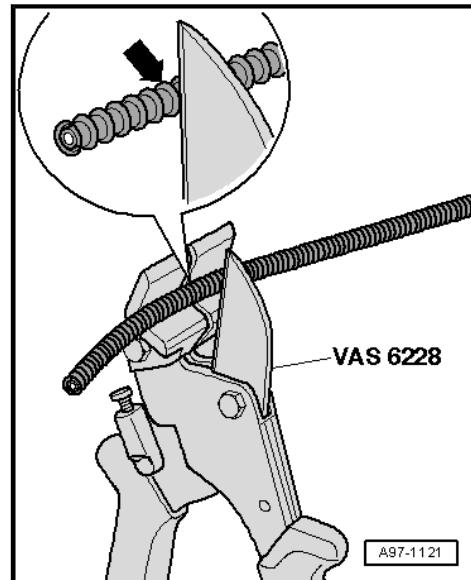
Note

- ◆ Connector couplings are available for connecting the fiber-optic cables. Refer to ⇒ *Electronic Parts Catalog (ETKA)* .
- ◆ *Installing the new fiber optic cable in wiring harness connector. Refer to ⇒ "2.5.4 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector", page 99 .*

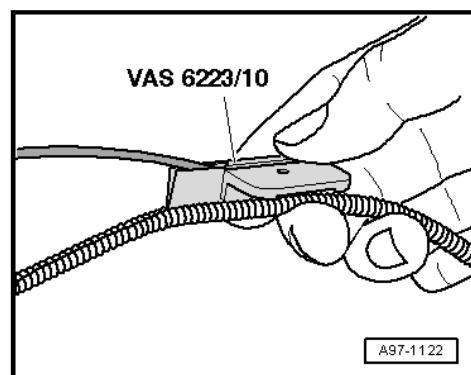


Corrugated tube, install on fiber optic cable.

- Cut back the corrugated tube to the corresponding length.
- Use the Hose Cutting Pliers - VAS 6228- or a sharp knife for cutting.
- The corrugated tube must not be cut through using a side cutter under any circumstances
- The corrugated tube must be cut on the wave peak -arrow-, not in the wave trough.
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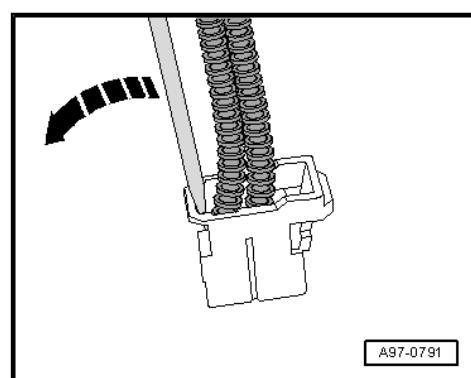
- Guide the fiber-optic cable into the Fiber-Optic Repair Set - Tube Tool - VAS 6223/10- as shown.
- Position the pliers for the corrugated tube assembly on the slot on the corrugated tube.
- Position the pliers for the corrugated tube assembly in the slit all around the corrugated tube. The fiber optic cable is then routed in the corrugated tube.



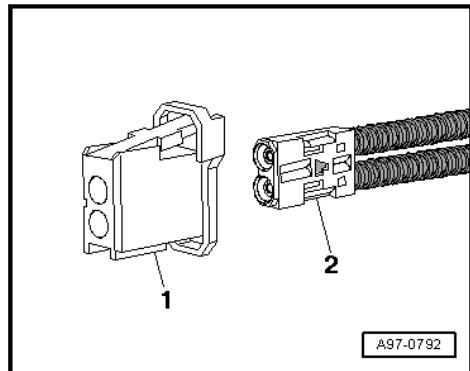
2.5.4 Fiber-Optic Cable, Disconnecting from Wiring Harness Connector

Removing

- Remove the connector for the fiber optic cable from the applicable control module.
- Release the catch in the fiber optic cable connector -arrow-.



- Pull the fiber optic cable basic module -2- out of connector housing -1-.



Caution

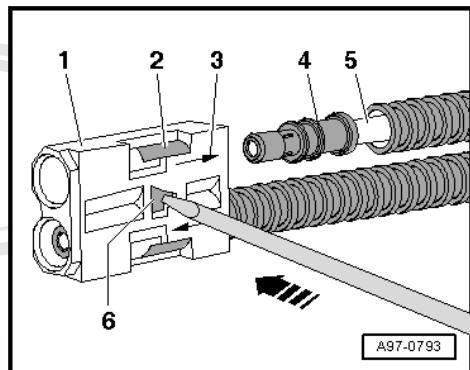
- ◆ Make colored dots to mark assignment of the fiber optic cable -5- to the corresponding sockets in the base module -1-.
- ◆ Note the arrows -3- for allocation on the base module "IN" and "OUT".

- Release the secondary lock -6- (blue pin) using a small screwdriver -arrow-.
- Release the catch -2- and remove the fiber-optic cable -5- with brass connector pin -4- from the base module -1-.

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Installing

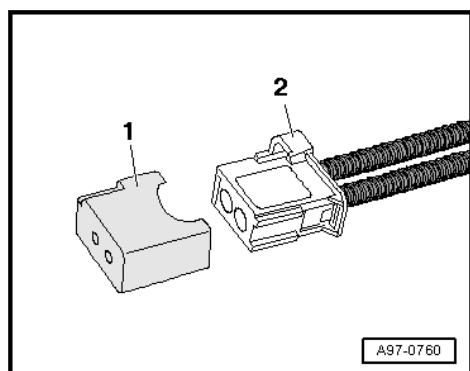
Install in reverse order of removal and note the following:



Note

- ◆ Cover the open connector -2- for the fiber-optic cable using the Fiber-Optic Repair Set - Connector Protective Caps - VAS 6223/9- -item 1-.
- ◆ The protective cap prevents contamination of or mechanical damage to the front surface of the fiber-optic cable which would impair light transmission.

- Install fiber optic cable in line with markings.



2.6 Antenna Wires, Repairing

⇒ [“2.6.1 Aerial Cable Repair Set VAS 6720”, page 100](#)

⇒ [“2.6.2 Replacing a Complete Antenna Wire”, page 111](#)

2.6.1 Aerial Cable Repair Set VAS 6720

Special tools and workshop equipment required

- ◆ Antenna (Aerial) Cable Repair Set - VAS 6720-

The Antenna (Aerial) Cable Repair Set - VAS 6720- makes it possible to perform a quality repair on antenna wires RG 174 (blue) and RTK 031 (black). The set contains the insulation removal tools and the crimping tools for both antenna wires. Moreover, all the individual parts needed are in the kit. Only the zero-coded coupler (green) is needed. Refer to the ⇒ Electronic Parts Catalog (ETKA) for all other connecting wires (not

sealed and waterproof) for the various vehicle systems. These adapter antenna wires must always be ordered separately depending on the vehicle type.



Note

Additional information. Refer to ⇒ Antenna (Aerial) Cable Repair Set - VAS 6720- Operating Instructions .

Checking the antenna wire:

Before starting the repair, determine which antenna wire using the gauge.

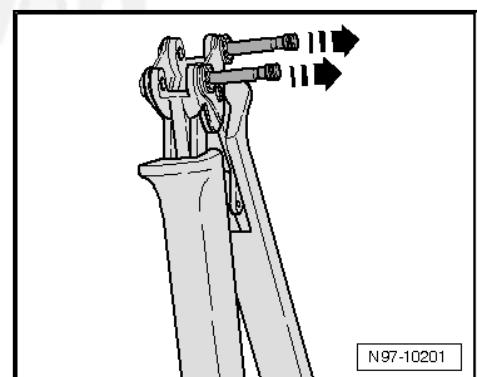
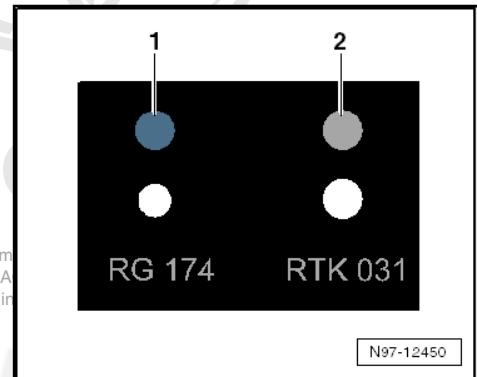
- ◆ -1- System RG 174 = blue
- ◆ -2- System RTK 031 = gray

The positioners on the heads of the tools are color coded on both systems.

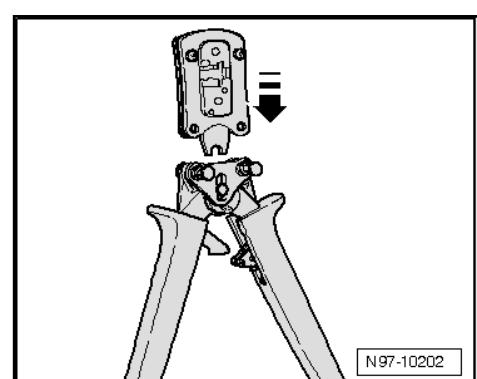
Replacing the tool head:

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- Select the appropriate tool head based on the antenna wire test. Refer to [⇒ page 101](#) .
- Open the handle on the pliers all the way.
- Release and remove both locking pins -arrows- from the handle.

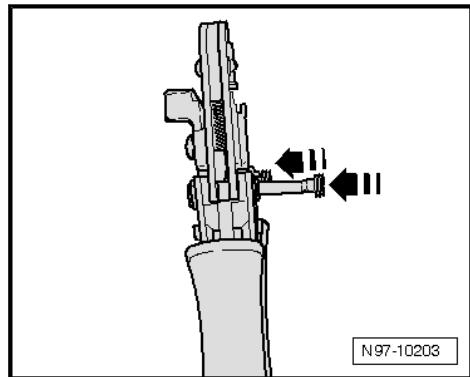


- Attach the necessary tool head to the handle from the top -arrow-.



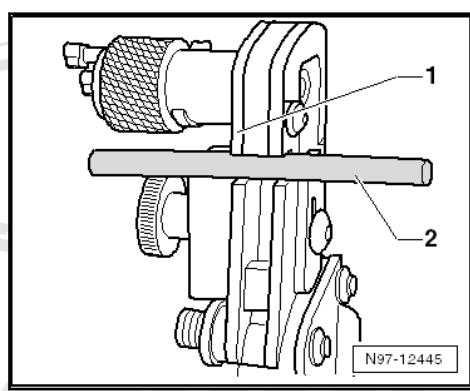
- Insert the pins -arrows- into the handle in order to lock the tool head into place.

Cutting the antenna wire:

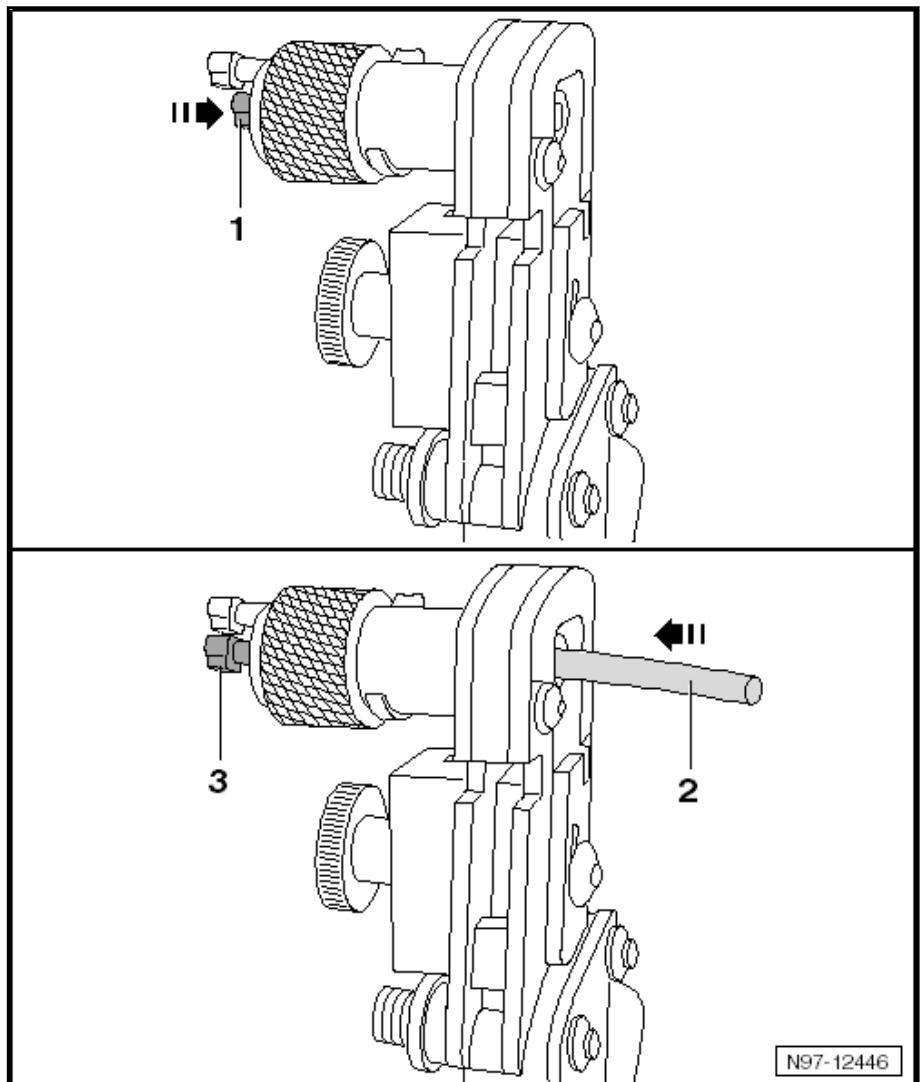


- Slide the antenna wire -2- into the cutting device -1-.
- Close the tool then open it again.
- Pull the antenna wire out of the cutting device.

Removing the insulation from the shield:

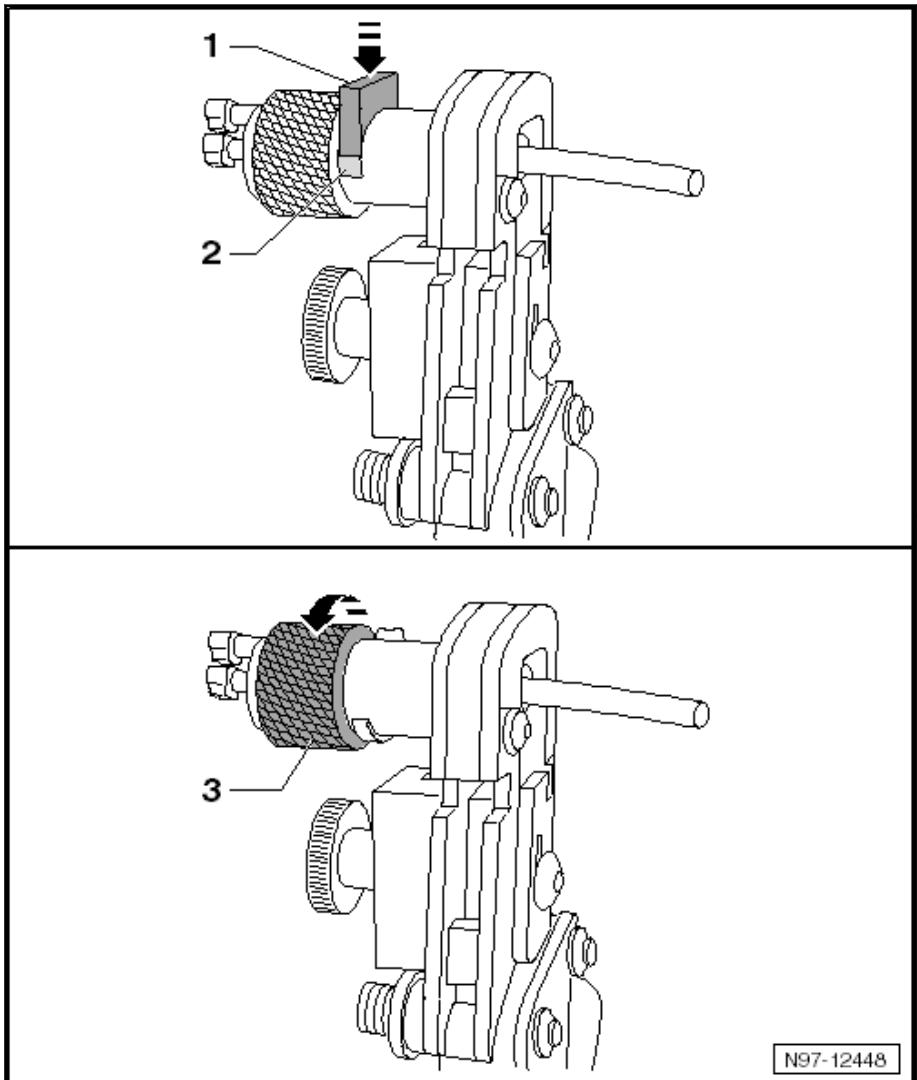


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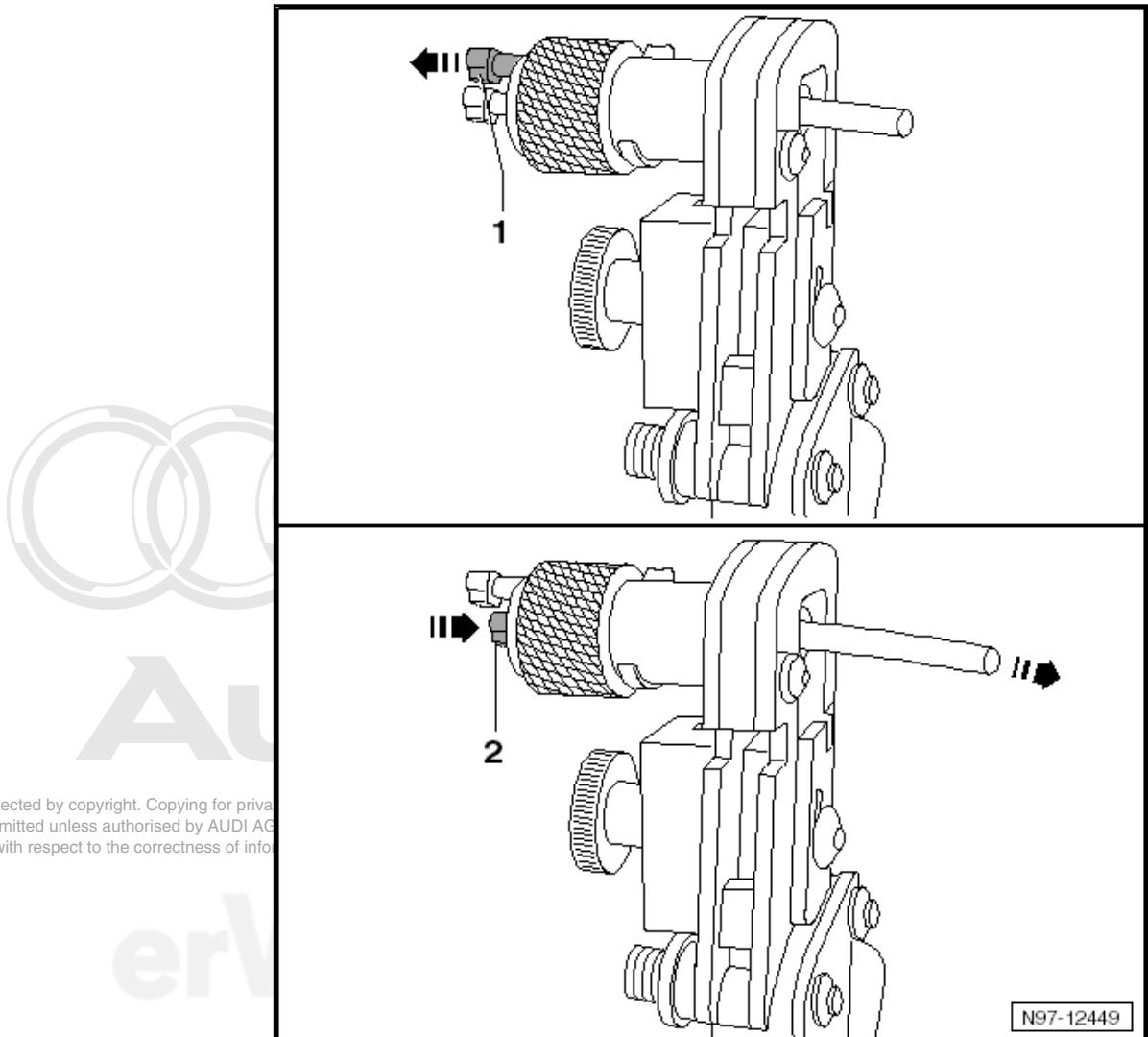


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- Push the locking pin -1- all the way into the **rotating cutting** piece.
- Push the antenna wire -2- all the way into the rotating cutting piece. The locking pin -3- cannot be seen completely.

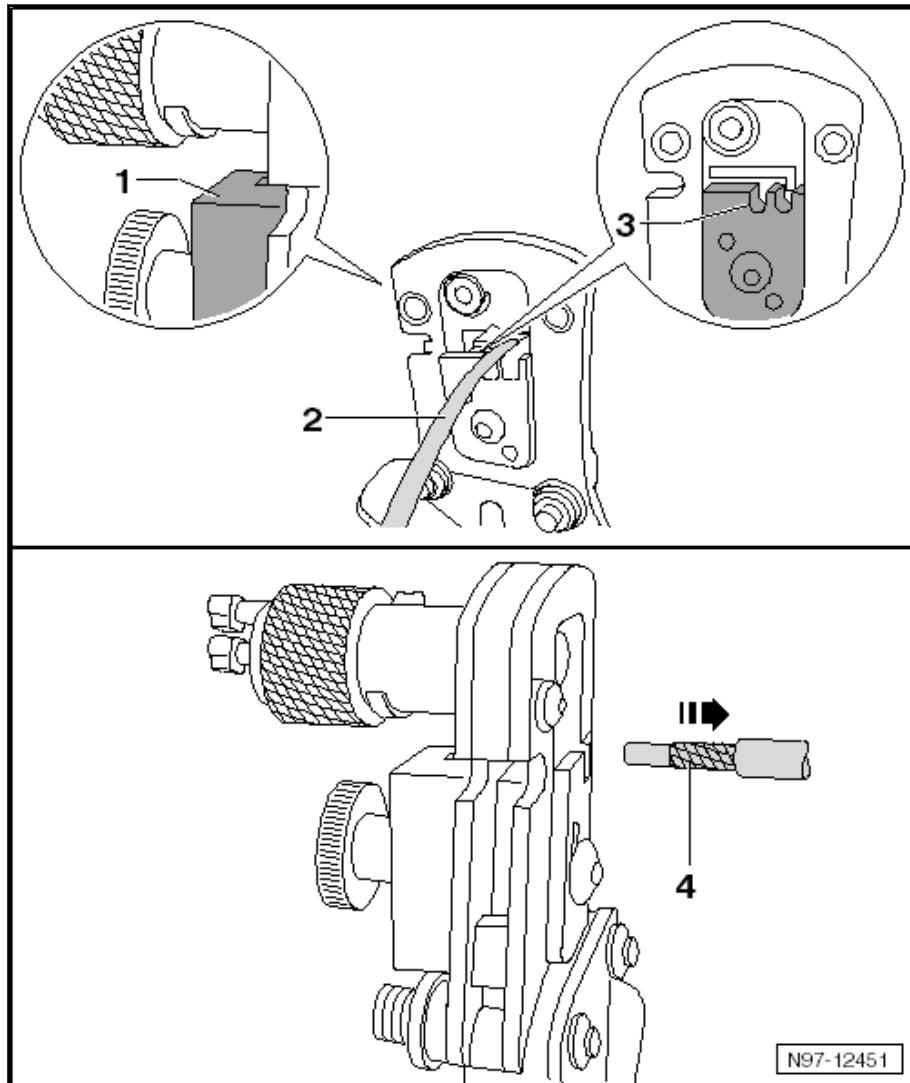


- Push the blade holder -1- against the axle of the rotating cutting segment until it locks into place. The gap -2- under the blade holder is completely closed.
- Hold the antenna wire so that it cannot turn.
- Turn the rotating cutting segment -3- 2 times in direction of arrow until it starts to turn easily.



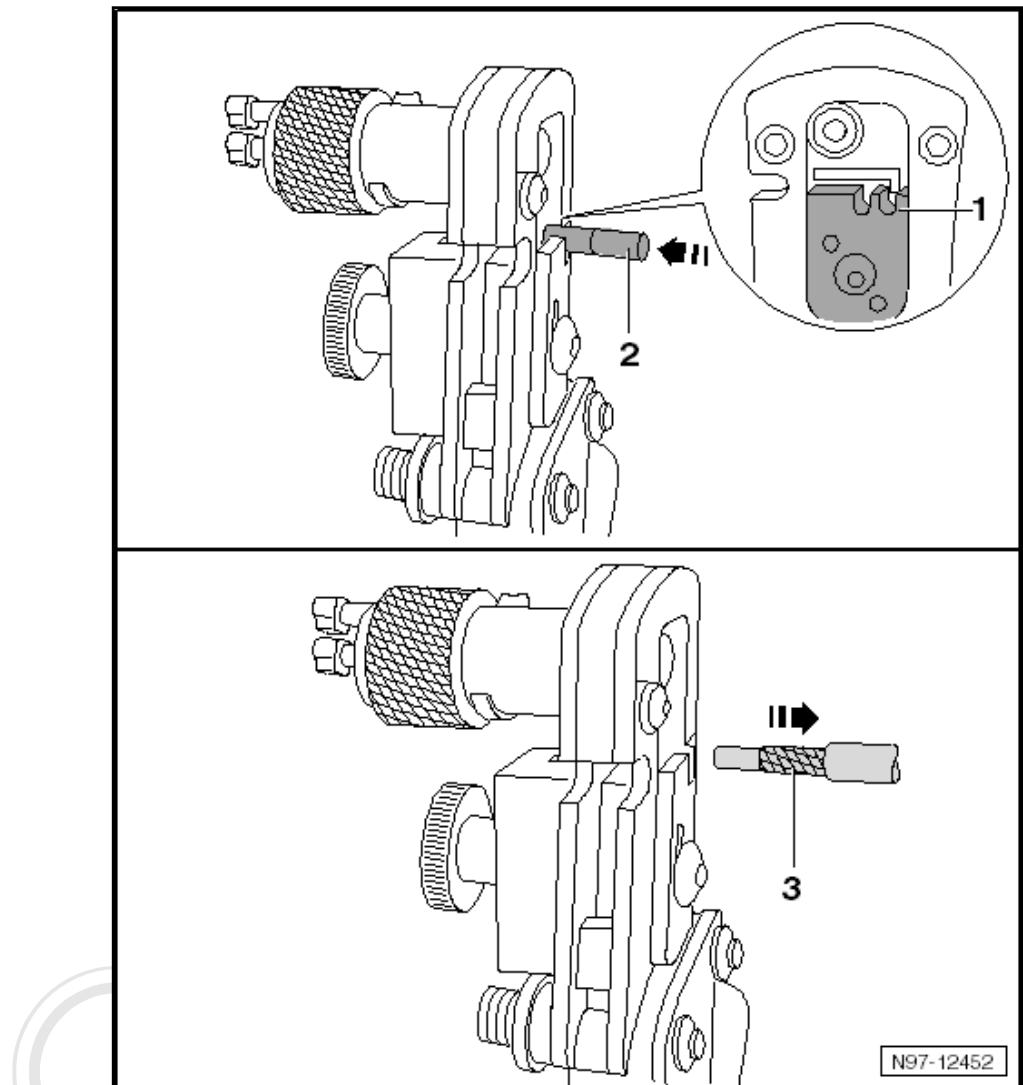
- Pull out the release pin -1-. The blade holder unlocks and separates from the antenna wire.
- Push the locking pin -2- all the way into the rotating cutting piece. The antenna wire is pushed out of the rotating cutting segment.
- Remove insulation from the antenna wire.
- Remove any insulation remaining on the rotating cutting segment.

Removing the outer jacket of insulation:



- Slide the antenna wire -2- in the mount -3- into the tool head until it stops -1-.
- Close the tool then open it again.
- Remove the antenna wire -4-.

Removing the inner insulation:



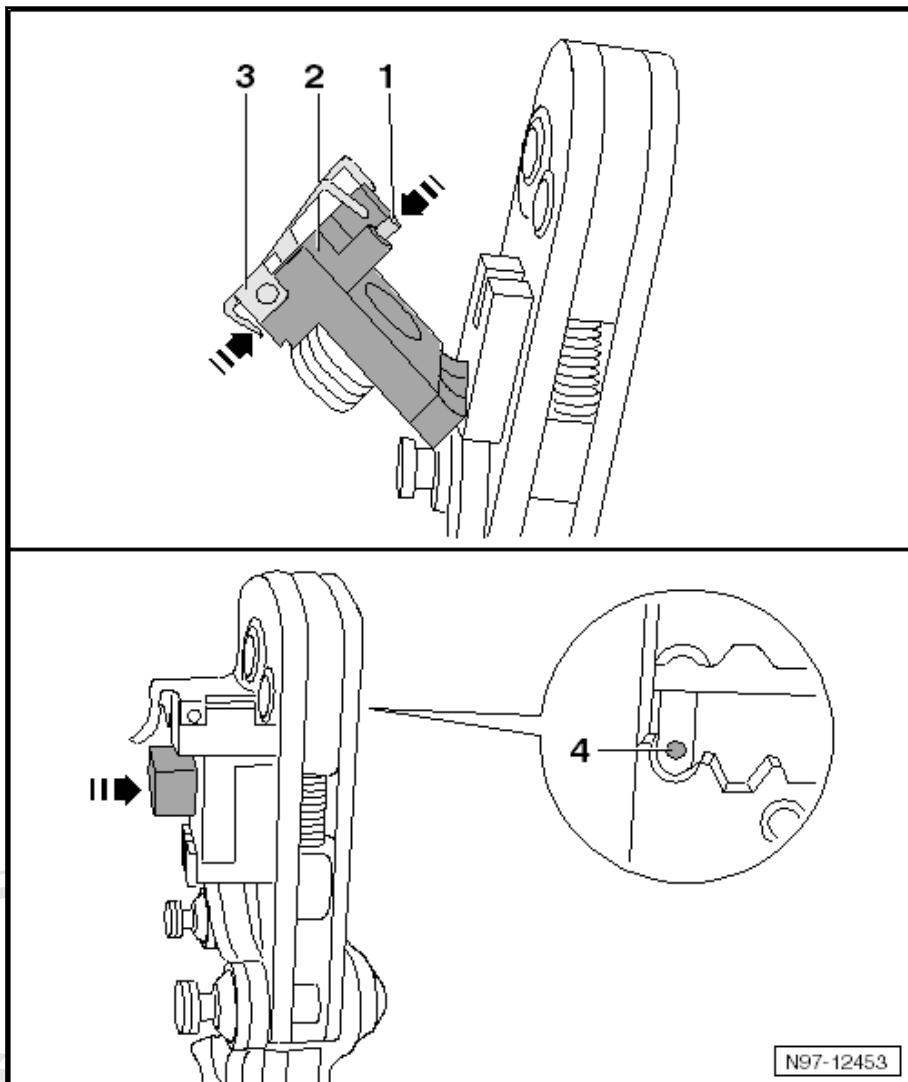
N97-12452

- Push the antenna wire -2- in the mount -1- all the way into the tool head.
- Close the tool then open it again.
- Remove the antenna wire -3-.

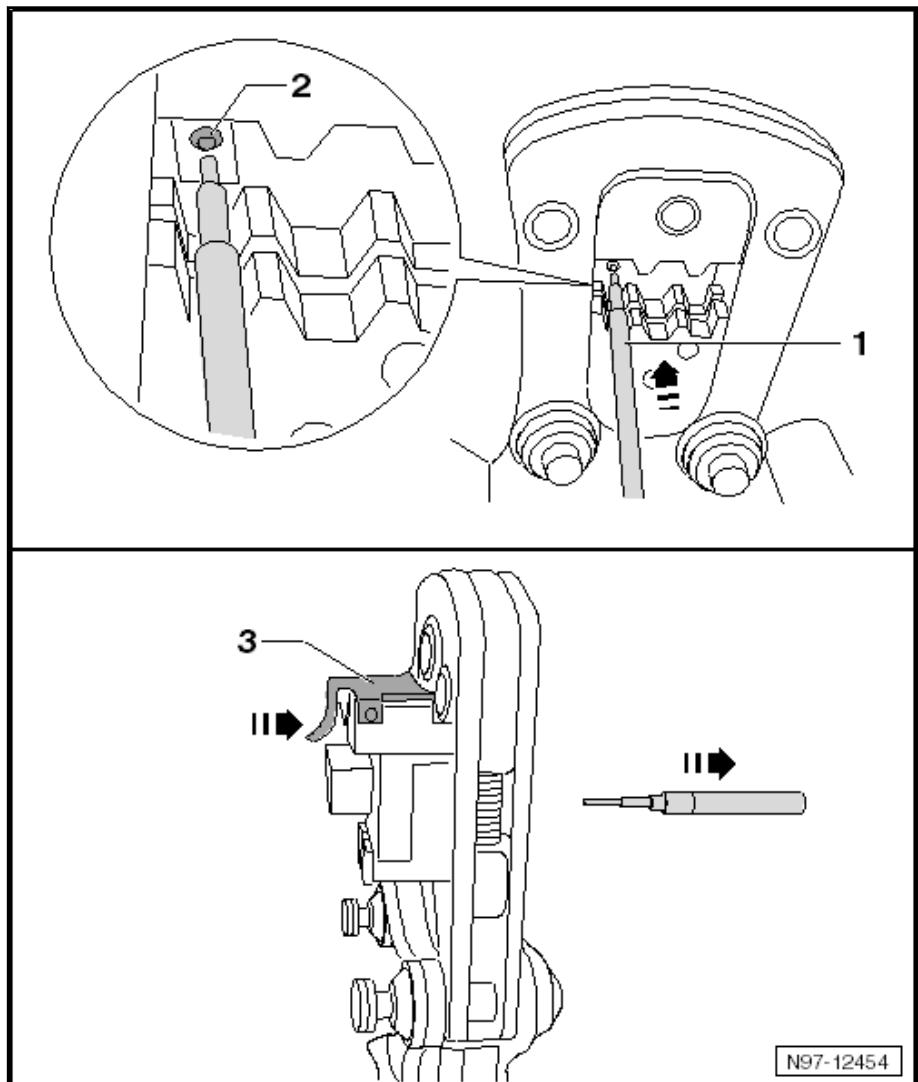
Crimping the inner conductor:

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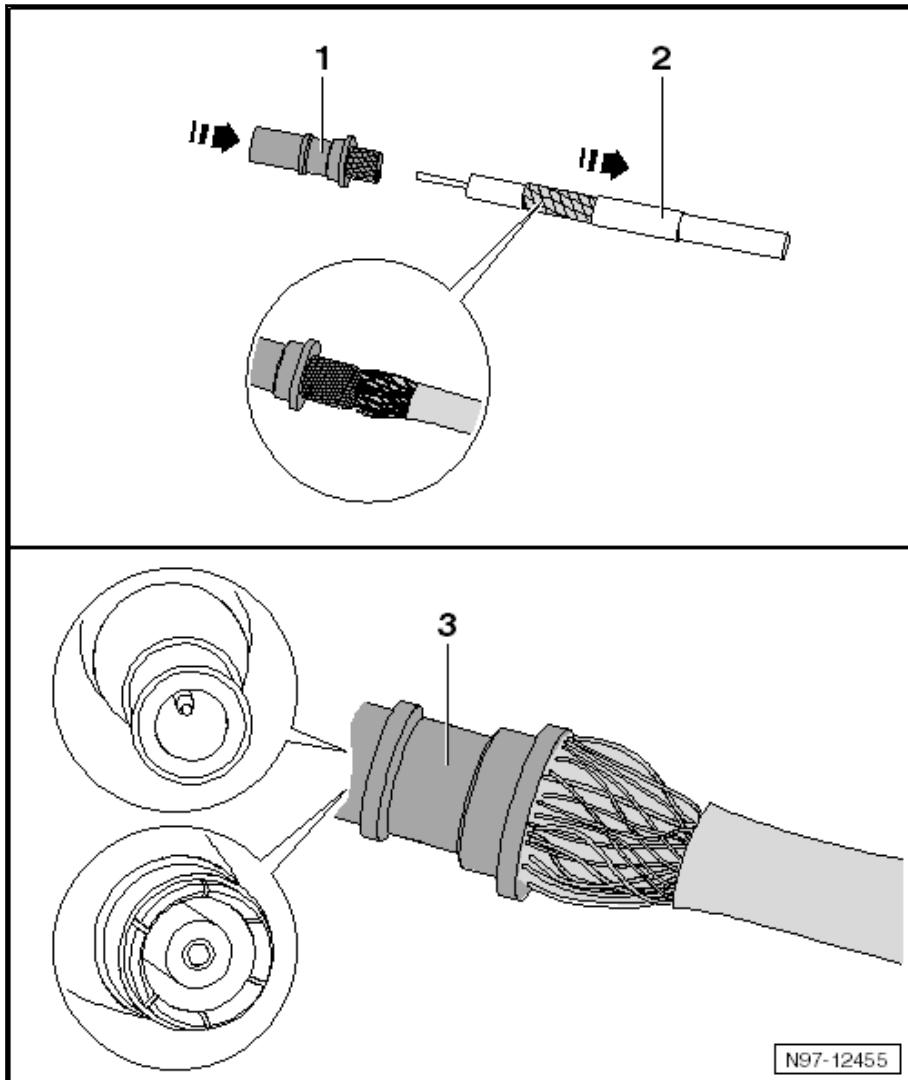


- Select the appropriate tool head based on the antenna wire test. Refer to [page 101](#) and [page 101](#).
- Unfold the positioner -2-.
- Open the positioning plate -3-. **The positioning plate swivels upward** permitted unless authorised by AUDI AG. AUDI AG does not guarantee or accept any liability with respect to the correctness of information in this document. Copyright by AUDI AG.
- Push the inner contact -1- all the way into the positioner and loosen the positioning plate. The inner contact is attached.
- Fold the positioner back in. The inner contract -4- is positioned inside the tool head.



- Slide the antenna wire -1- into the inner contact -2- in the tool head. Hold the positioner tight while doing this.
- Lock the tool until it opens by itself.
- Open the positioning plate -3- and pull out the antenna wire.

Crimping the outer conductor:



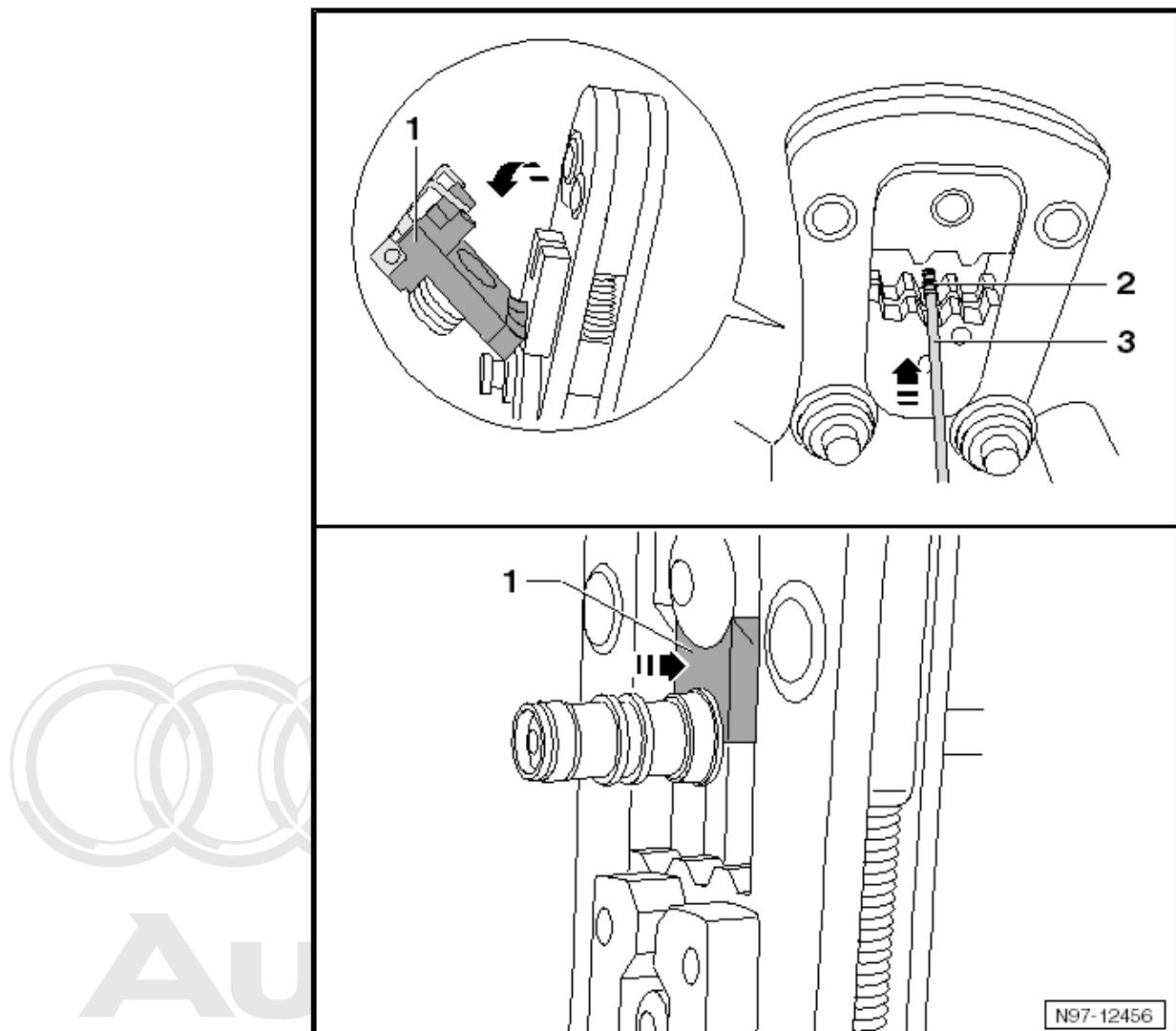
- Slide the sleeve -2- and outer contact -1- over the inner conductor. The knurled contact piece must be pushed under the shield, but over the aluminum foil.
- Slide on the outer contact piece -3- all the way. Make the bushing/pin fit correctly when doing this.
- Push the sleeve -2- up to the outer contact.



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- Open the tool and fold out the positioner -1-.
- Position the antenna wire -3- with the outer contact -2- attached, into the center profile at the contact edge of the tool head.
- Close the tool then open it again.
- Remove the antenna wire -3-.

2.6.2 Replacing a Complete Antenna Wire

A repair procedure has been developed for replacing antenna wires. Instead of a complete antenna wire, connecting wires of different lengths and various adapter leads are now available as replacement parts. Refer to ⇒ Electronic Parts Catalog (ET-KA) .

 Note

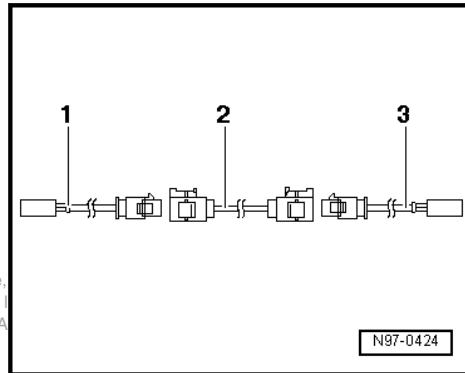
- ◆ Original replacement parts are suitable for all antenna wires and wire cross sections that need to be replaced.
- ◆ The wires are to be used retroactively for all Audi models for all the antenna wire cross sections fitted.
- ◆ All adapter leads and connecting wires are suitable for various transmission and reception signals.
- ◆ The repair concept can also be used as a testing or retrofitting solution.

Special tools and workshop equipment required

- ◆ -1- Adapter wire, for connection to radio; length: approximately 30 cm



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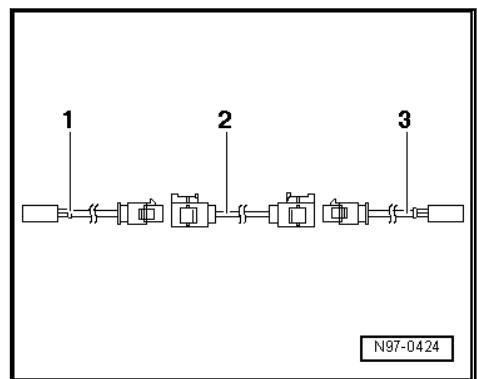
- ◆ -2- Connecting wire, available in various lengths
- ◆ -3- Adapter wire, for connection to antenna; length: approximately 30 cm

Procedure

Example: antenna wire from the radio to the antenna is faulty.

- Separate the connectors of the faulty antenna wiring from their components.
- Determine the path of the faulty antenna wire in the vehicle and measure the total length of antenna wire to be replaced.

- The entire length of the antenna wire consists of the length of the required adapter wires -1 and 3- and the connecting wire -2-.
- Subtract 60 cm from the total length of antenna wire measured, to determine the length of connecting wire needed.
- Obtain the correct length of the required adapter wires and connecting wires as an original replacement part. Refer to ⇒ Electronic Parts Catalog (ETKA) .
- Cut the connectors off of the faulty antenna wiring.
- Leave the rest of the defective antenna wire in the vehicle.
- Connect the adapter leads to devices in the vehicle.
- Equip harness connectors with piece of foam hose to avoid rattle.
- Route and secure the connecting wire parallel to the old antenna wire.



Note

Antenna wires must not be kinked or excessively bent! The bending radius must not be less than 50 mm.

- Connect the connecting wire with the adapter leads.
- To prevent rattling noises, slide a fitting piece of a foam tube onto the antenna connector.
- Check the function.

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2.7 Connector Housings and Connectors, Repairing

⇒ “[2.7.1 Connector Housings and Connectors, Repair Information](#)”, page 113

⇒ “[2.7.2 Contacts in Connector Housing, Repairing](#)”, page 114

⇒ “[2.7.3 Single Wire Seals, Installing](#)”, page 114

⇒ “[2.7.4 Connector Housing with Insulation Displacement Connections, Repairing](#)”, page 115

2.7.1 Connector Housings and Connectors, Repair Information



Note

- ♦ Observe general notes for repairs on the vehicle electrical system. Refer to ⇒ “[2.1 Vehicle Electrical System, General Repair Information](#)”, page 67 .
- ♦ Allocation of crimp contacts with correct fit to connector housing is performed according to the part number stamped in on the connector housing. ⇒ *Electronic Parts Catalog (ETKA); Special Catalog “Electrical Fasteners”; Electrical Equipment; subgroup 71 chart 970-00*.
- ♦ Damaged connector housings must always be replaced.

2.7.2 Contacts in Connector Housing, Re-pairing

Removing

- Repairing the contact in the connector housings is described in ⇒ Electronic Parts Catalog (ETKA) .

◆ Select the “electric connecting element” special catalog.

◆ Select model year

◆ Select the electric electric; subgroup 71 from chart 970-00

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◆ Telephone Information, Selecting

◆ Repair Information, Selecting

2.7.3 Single Wire Seals, Installing

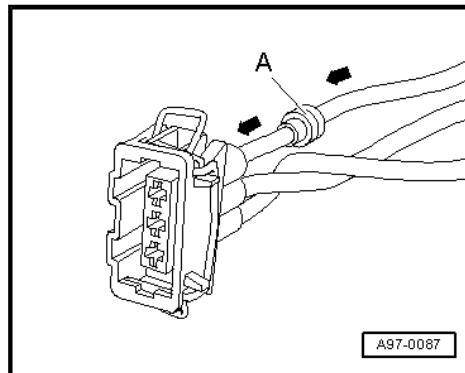
Procedure



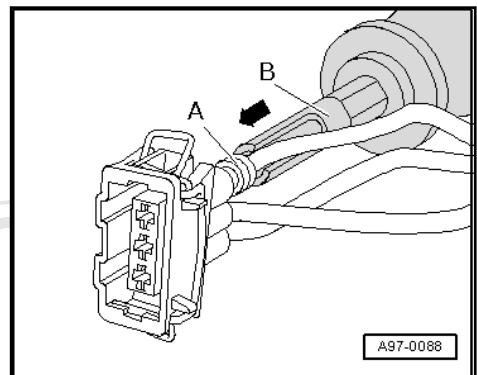
Note

- ◆ *Single wire seals prevent the penetration of water and dirt into the connector housing. They are installed, for example, in the engine compartment and must be reinstalled after a repair.*
- ◆ *Single wire seal is crimped on at the factory together with contact on the wire, this is not the case for repair wires. The single wire seal must be slid onto the wire before crimping the repair wire.*
- ◆ *Single wire seals must always fit with the repair wire cross-section. Outer circumference of single wire seal is aligned according to chamber circumference of the connector housing. Perform assembly using only the assembly tool with correct fit.*

- Put single wire seal -A- onto free end of repair wire.
- When doing this, the single wire seal small diameter must point toward the connector housing.

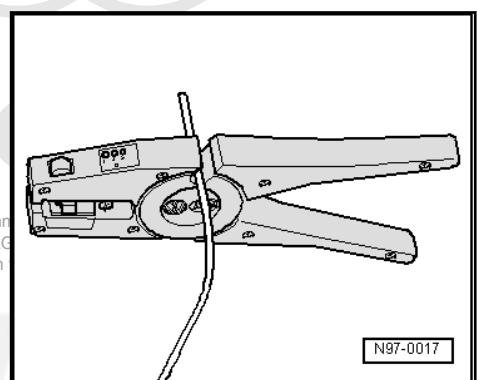


- Slide the single wire seal -A- onto the repair wire up to the connector housing and then into the housing as far as the stop using the appropriate assembly tool -B-.



- Shorten the repair wire and the vehicle-specific wiring harness single wire as needed using the Wiring Harness Repair Set - Wire Strippers - VAS 1978/3- .
- Crimp the stripped ends of repair wire and single wire of the vehicle-specific wiring harness using crimping pliers and a crimp connector. Refer to ["2.4.4 0.13 mm² - 6 mm² Wire, Repairing", page 81](#) .

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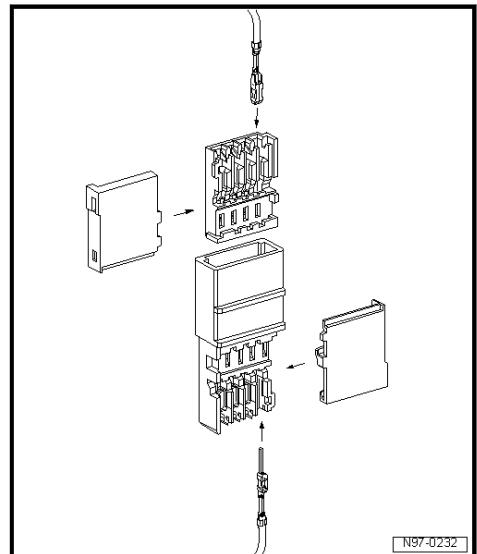


2.7.4 Connector Housing with Insulation Displacement Connections, Repairing



Note

- ◆ For technical reasons, the connector housing for the wire terminals can be supplied only with the contacts pushed in.
- ◆ These contacts can be removed at every other connector housing in the event they are not required.
- ◆ Repair wires which have already been equipped with corresponding contacts in crimped on form are available. Refer to the ["Electronic Parts Catalog \(ETKA\)"](#).



2.8 Connector Housings, Releasing and Disassembling

Removing

- Disassembling the connector housings is described in the ["Electronic Parts Catalog \(ETKA\)"](#) .
- ◆ Connector Housing, Selecting
- ◆ Telephone Information, Selecting
- ◆ Repair Information, Selecting

3 Contact Surface Cleaning Set - VAS 6410-

⇒ “3.1 Contact Surface Cleaning Set VAS 6410 , Using”, page 116

3.1 Contact Surface Cleaning Set - VAS 6410- , Using

⇒ “3.1.1 Wiring Eyelets, Repairing”, page 116

⇒ “3.1.2 Threaded Connections, Repairing”, page 118

⇒ “3.1.3 Battery Terminal Clamp and Battery Terminal, Cleaning”, page 120

⇒ “3.1.4 Protecting”, page 121

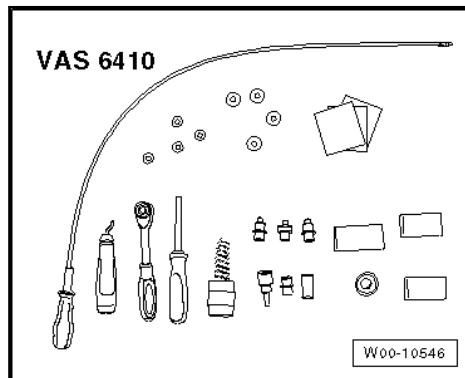
The Contact Surface Cleaning Set - VAS 6410- makes it possible to provide the optimal quality of repairs in the vehicle electrical system. Using the tools, service work can be performed in the area of the contact sensor on the threaded connection wiring harnesses in the high current circuit (starter and charging current). The Contact Surface Cleaning Set - VAS 6410- is adapted to the vehicle structural measurements and ensures correct servicing and a comfortable procedure.



Note

The illustrations of the service work only serve as examples.

Contact Surface Cleaning Set - VAS 6410-

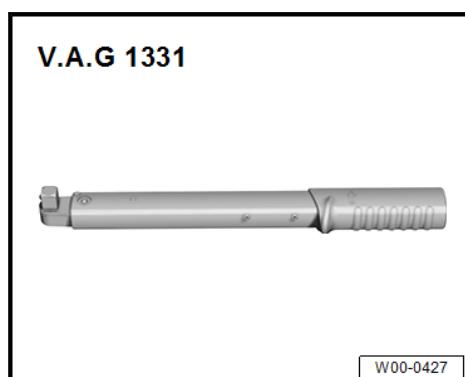


W00-10546

3.1.1 Wiring Eyelets, Repairing

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- ◆ Torque Wrench 1331 5-50Nm -VAG 1331-



W00-0427



Note

- ◆ *Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.*
- ◆ *The gray sanding pads are for slight contamination and suitable for "soft surfaces". The red sanding pads are for heavy contamination and suitable for "hard surfaces".*

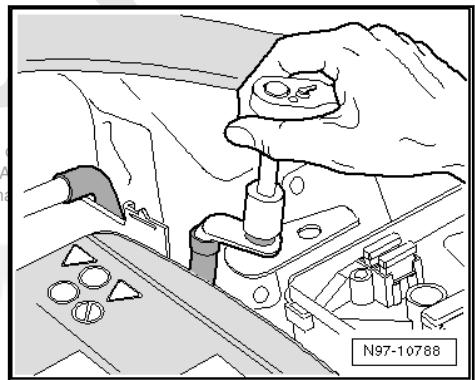


WARNING

*Risk of injury! Follow the warnings and safety precautions.
Refer to **» "1.3 Warnings and Safety Precautions", page 3***

- Disconnect battery.
- Loosen the cap nut and remove the wiring eyelet from the threaded connection.
- Check the wiring eyelet for corrosion, contamination, etc.
- Select the corresponding adapter and the corresponding sanding pad.

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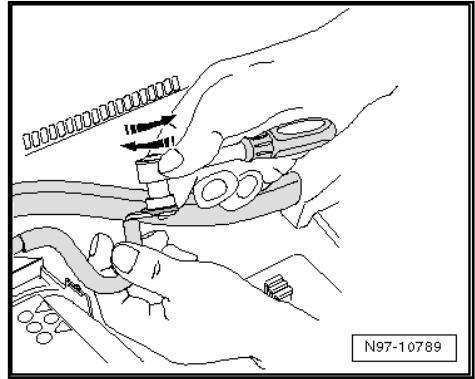
Note

The sanding block can be used instead.



Caution

Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.



Note

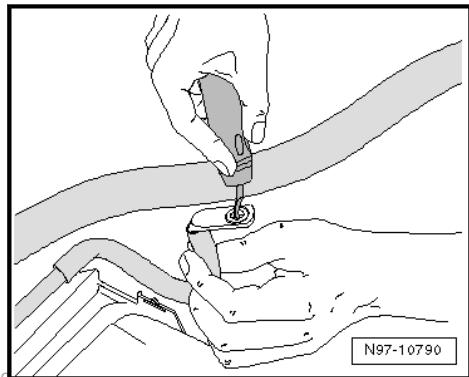
Due to the different thicknesses of the tin layer, the cleaning process must be performed in several steps and a visual inspection of the wiring eyelet between steps is necessary.

- Insert the adapter in the wiring eyelet and sand off the corrosion and contamination with circular motions.
- Check the wiring eyelet and sand it again if necessary.

- If necessary, remove the burr on the wiring eyelet with the deburrer.
- Reinstall the wiring eyelet with the specified torque. Refer to ⇒ [Wiring diagrams, Troubleshooting & Component locations](#).

 Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.



- Apply protective material to the connection. Refer to ⇒ ["3.1.4 Protecting", page 121](#)
- Reconnect the battery.



WARNING

*Risk of injury! Prior to handling or servicing batteries, read, understand and observe the Warning and Safety Measures
Refer to ⇒ ["1.3 Warnings and Safety Precautions", page 3](#)*

- Reprogram the window regulators, enter the radio code, set the clock and, if necessary, recode control modules that have error messages.

3.1.2 Threaded Connections, Repairing

Special tools and workshop equipment required

- ◆ Torque Wrench 1331 5-50Nm -VAG 1331-



 Note

- ◆ *Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.*
- ◆ *The gray sanding pads are for slight contamination and suitable for "soft surfaces". The red sanding pads are for heavy contamination and suitable for "hard surfaces".*



WARNING

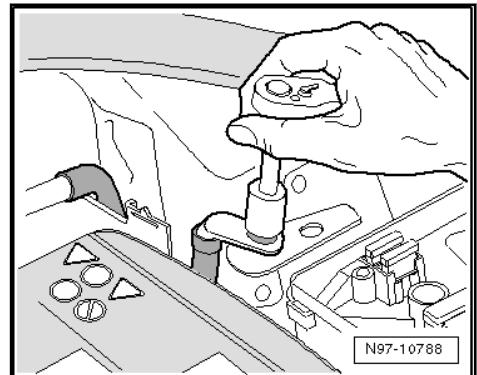
Risk of injury! Prior to handling or servicing batteries, read, understand and observe the Warning and Safety Measures
Refer to ➔ "1.3 Warnings and Safety Precautions", page 3

- Disconnect battery.
- Loosen the cap nut and remove the wiring eyelet from the threaded connection.
- Check the threaded connection for corrosion, contamination, etc.
- Select the corresponding adapter and the corresponding sanding pad for the threaded connection.



Caution

Make sure the tin layer is not worn down too much and the copper is not visible. A galvanic element can form from this, destroying the metal and causing incorrect repairs.



Note

Due to the different thicknesses of the tin layer, the cleaning process must be performed in several steps and a visual inspection of the wiring eyelet between steps is necessary.

- Place the adapter on the threaded connection and sand off the corrosion and contaminants with circular movements.
- Check the threaded connection and sand it again if necessary.
- Retighten the connection and, if necessary, the anti-twist mechanism to the specified torque. Refer to ➔ **Wiring diagrams, Troubleshooting & Component locations**.

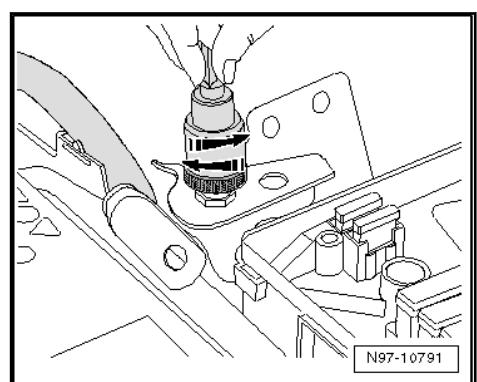
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Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.

- Apply protection material to the threaded connection. Refer to ➔ "3.1.4 Protecting", page 121 .
- Reconnect the battery.



WARNING

Risk of injury! Prior to handling or servicing batteries, read, understand and observe the Warning and Safety Measures
Refer to ➔ "1.3 Warnings and Safety Precautions", page 3

- Reprogram the window regulators, enter the radio code, set the clock and, if necessary, recode control modules that have error messages.

3.1.3 Battery Terminal Clamp and Battery Terminal, Cleaning

Special tools and workshop equipment required

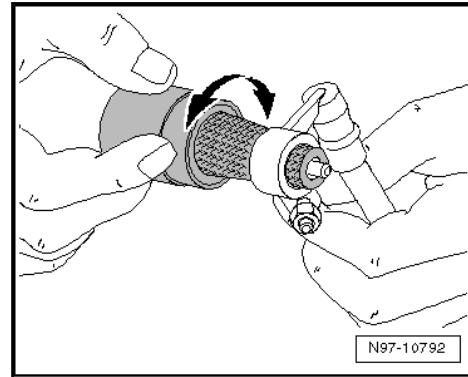
- ◆ Torque Wrench 1331 5-50Nm -VAG 1331-



Do not use rust remover, contact spray or grease because the lack of friction will cause the torque to be exceeded when installing and this will lead to the threaded connection breaking.



- Disconnect battery.
- Check the battery terminal clamp and the battery terminal for corrosion or dirt.
- The battery terminal clamp is cleaned with the battery terminal cleaner wire brush using circular motions.

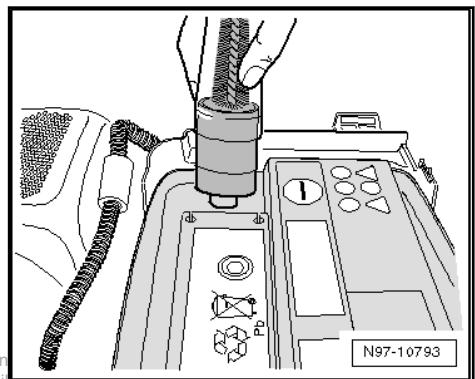


- The battery terminal is cleaned with the bottom side of the terminal cleaner using circular motions.



WARNING

Risk of injury! Prior to handling or servicing batteries, read, understand and observe the Warning and Safety Measures
Refer to **⇒ "1.3 Warnings and Safety Precautions", page 3**



- Reconnect the battery and tighten the battery terminals to the specified torque.

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Note

Optimal contact is ensured if the bolted components are tightened to the specified torque after cleaning.

3.1.4 Protecting



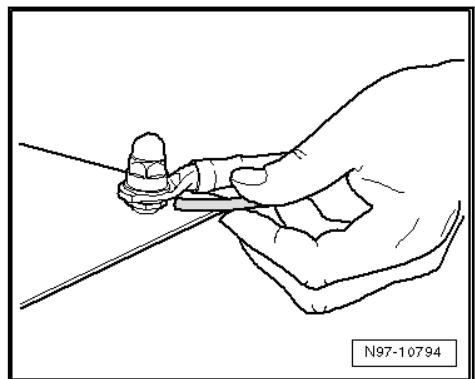
Caution

Missing protection leads to the electrical system damage.

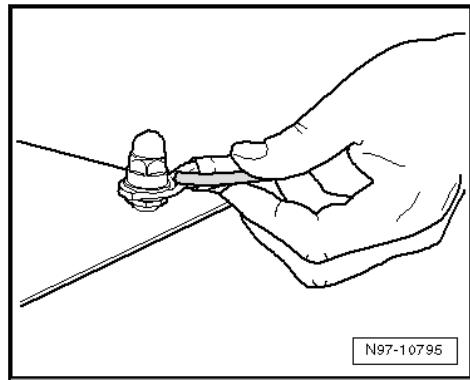


Note

- ◆ All threaded connections must be tightened to the specified torque.
- ◆ When applying protection, always use the accompanying hose on the protection container.
- ◆ Protection wax is used in the cool area.
- ◆ Cavity protection wax is used in the warm area.
- ◆ The protection material draws itself into the affected places by capillary action.
- Hold the injector under the wiring eyelet and spray all around the pins.



- Hold the injector above the wiring eyelet and spray all around the pins and wiring eyelet.



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4 ESD Work Surface VAS 6613

⇒ [“4.1 ESD Work Surface VAS 6613 , Using”, page 123](#)

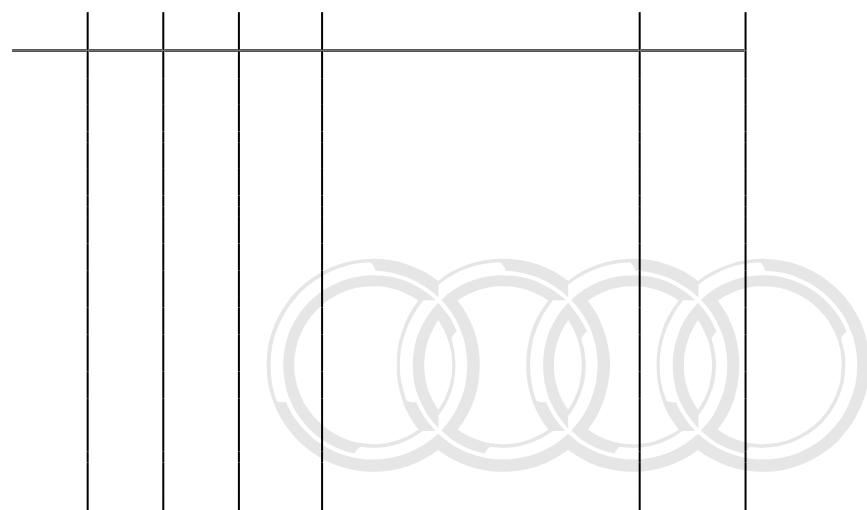
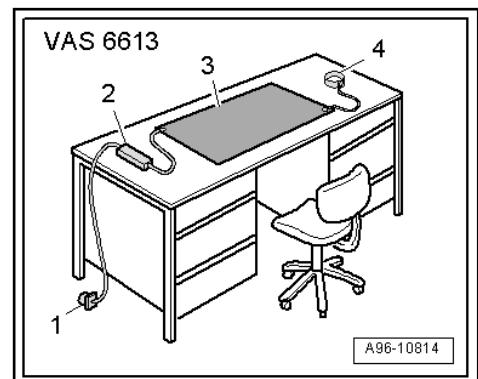
4.1 ESD Work Surface - VAS 6613- , Using

- ◆ The ESD Work Surface - VAS 6613- protects electronic components from getting damaged by an electrostatic charge.
- ◆ This makes it possible to perform repairs on sensitive electronic components on an open mat.
- ◆ For more information on what work can be performed on the ESD Work Surface - VAS 6613- . Refer to the "Electrical Equipment" chapter in the repair manual.
- Place the electrostatic discharge mat -3- from ESD Work Surface - VAS 6613- on a clean, dry table.
- Connect the ground -2- to one of the buttons on the mat.
- Connect the ground connector adapter -1- to the adapter connector on an outlet with contact protection or connect the alligator clip to a ground in the building or a water pipe.
- Connect the wrist strap -4- to one of the buttons on the mat.
- Attach the wrist strap directly to the wrist - never to a shirt sleeve or jacket sleeve.



Caution

For repairs on particularly sensitive electronic components and when the circuit board is open, use only non-magnetic tools, for example, a Wrench - Driver - T10072- .



Cautions & Warnings

Please read these WARNINGS and CAUTIONS before proceeding with maintenance and repair work. You must answer that you have read and you understand these WARNINGS and CAUTIONS before you will be allowed to view this information.

- If you lack the skills, tools and equipment, or a suitable workshop for any procedure described in this manual, we suggest you leave such repairs to an authorized Audi retailer or other qualified shop. We especially urge you to consult an authorized Audi retailer before beginning repairs on any vehicle that may still be covered wholly or in part by any of the extensive warranties issued by Audi.
- Disconnect the battery negative terminal (ground strap) whenever you work on the fuel system or the electrical system. Do not smoke or work near heaters or other fire hazards. Keep an approved fire extinguisher handy.
- Audi is constantly improving its vehicles and sometimes these changes, both in parts and specifications, are made applicable to earlier models. Therefore, part numbers listed in this manual are for reference only. Always check with your authorized Audi retailer parts department for the latest information.
- Any time the battery has been disconnected on an automatic transmission vehicle, it will be necessary to reestablish Transmission Control Module (TCM) basic settings using the Audi Factory Approved Scan Tool (ST).
- Never work under a lifted vehicle unless it is solidly supported on stands designed for the purpose. Do not support a vehicle on cinder blocks, hollow tiles or other props that may crumble under continuous load. Never work under a vehicle that is supported solely by a jack. Never work under the vehicle while the engine is running.
- For vehicles equipped with an anti-theft radio, be sure of the correct radio activation code before disconnecting the battery or removing the radio. If the wrong code is entered when the power is restored, the radio may lock up and become inoperable, even if the correct code is used in a later attempt.
- If you are going to work under a vehicle on the ground, make sure that the ground is level. Block the wheels to keep the vehicle from rolling. Disconnect the battery negative terminal (ground strap) to prevent others from starting the vehicle while you are under it.
- Do not attempt to work on your vehicle if you do not feel well. You increase the danger of injury to yourself and others if you are tired, upset or have taken medicine or any other substances that may impair you or keep you from being fully alert.
- Never run the engine unless the work area is well ventilated. Carbon monoxide (CO) kills.
- Always observe good workshop practices. Wear goggles when you operate machine tools or work with acid. Wear goggles, gloves and other protective clothing whenever the job requires working with harmful substances.
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- Tie long hair behind your head. Do not wear a necktie, a scarf, loose clothing, or a necklace when you work near machine tools or running engines. If your hair, clothing, or jewelry were to get caught in the machinery, severe injury could result.

Cautions & Warnings

- Do not re-use any fasteners that are worn or deformed in normal use. Some fasteners are designed to be used only once and are unreliable and may fail if used a second time. This includes, but is not limited to, nuts, bolts, washers, circlips and cotter pins. Always follow the recommendations in this manual - replace these fasteners with new parts where indicated, and any other time it is deemed necessary by inspection.
- Illuminate the work area adequately but safely. Use a portable safety light for working inside or under the vehicle. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.
- Friction materials such as brake pads and clutch discs may contain asbestos fibers. Do not create dust by grinding, sanding, or by cleaning with compressed air. Avoid breathing asbestos fibers and asbestos dust. Breathing asbestos can cause serious diseases such as asbestosis or cancer, and may result in death.
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- Finger rings should be removed so that they cannot cause electrical shorts, get caught in running machinery, or be crushed by heavy parts.
- Before starting a job, make certain that you have all the necessary tools and parts on hand. Read all the instructions thoroughly, do not attempt shortcuts. Use tools that are appropriate to the work and use only replacement parts meeting Audi specifications. Makeshift tools, parts and procedures will not make good repairs.
- Catch draining fuel, oil or brake fluid in suitable containers. Do not use empty food or beverage containers that might mislead someone into drinking from them. Store flammable fluids away from fire hazards. Wipe up spills at once, but do not store the oily rags, which can ignite and burn spontaneously.
- Use pneumatic and electric tools only to loosen threaded parts and fasteners. Never use these tools to tighten fasteners, especially on light alloy parts. Always use a torque wrench to tighten fasteners to the tightening torque listed.
- Keep sparks, lighted matches, and open flame away from the top of the battery. If escaping hydrogen gas is ignited, it will ignite gas trapped in the cells and cause the battery to explode.
- Be mindful of the environment and ecology. Before you drain the crankcase, find out the proper way to dispose of the oil. Do not pour oil onto the ground, down a drain, or into a stream, pond, or lake. Consult local ordinances that govern the disposal of wastes.
- The air-conditioning (A/C) system is filled with a chemical refrigerant that is hazardous. The A/C system should be serviced only by trained automotive service technicians using approved refrigerant recovery/recycling equipment, trained in related safety precautions, and familiar with regulations governing the discharging and disposal of automotive chemical refrigerants.
- Before doing any electrical welding on vehicles equipped with anti-lock brakes (ABS), disconnect the battery negative terminal (ground strap) and the ABS control module connector.
- Do not expose any part of the A/C system to high temperatures such as open flame. Excessive heat will increase system pressure and may cause the system to burst.

Cautions & Warnings

- When boost-charging the battery, first remove the fuses for the Engine Control Module (ECM), the Transmission Control Module (TCM), the ABS control module, and the trip computer. In cases where one or more of these components is not separately fused, disconnect the control module connector(s).
- Some of the vehicles covered by this manual are equipped with a supplemental restraint system (SRS), that automatically deploys an airbag in the event of a frontal impact. The airbag is operated by an explosive device. Handled improperly or without adequate safeguards, it can be accidentally activated and cause serious personal injury. To guard against personal injury or airbag system failure, only trained Audi Service technicians should test, disassemble or service the airbag system.
- Do not quick-charge the battery **(for boost starting) for longer than one minute, and do not exceed 16.5 volts at the battery with the boosting cables attached.** Wait at least one minute before boosting the battery a second time.
- Never use a test light to conduct electrical tests of the airbag system. The system must only be tested by trained Audi Service technicians using the Audi Factory Approved Scan Tool (ST) or an approved equivalent. The airbag unit must never be electrically tested while it is not installed in the vehicle.
- Some aerosol tire inflators are highly flammable. Be extremely cautious when repairing a tire that may have been inflated using an aerosol tire inflator. Keep sparks, open flame or other sources of ignition away from the tire repair area. Inflate and deflate the tire at least four times before breaking the bead from the rim. Completely remove the tire from the rim before attempting any repair.
- When driving or riding in an airbag-equipped vehicle, never hold test equipment in your hands or lap while the vehicle is in motion. Objects between you and the airbag can increase the risk of injury in an accident.

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I have read and I understand these Cautions and Warnings.